DOCUMENT RESUME

ED 342 653 SE 052 574

AUTHOR	Pagni, David, Ed.
TITLE	CAMP-LA: Preservice Sampler Book, Grades K-8. Calculators and Mathematics Project.
SPONS AGENCY	California State Univ., Fullerton.; Los Angeles Unified School District, Calif.; National Science Foundation, Washington, D.C.
REPORT NO	ISBN-1-879853-08-6
PUB DATE	91
NOTE	147p.; For related documents, see SE 052 575-578.
AVAILABLE FROM	Cal State Fullerton Press, 2875 Orange Olive Road, Bldg. #2, Orange, CA 92665.
PUB TYPE	Guides - Classroom Use - Teaching Guides (For Teacher) (052) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Algebra; Arithmetic; *Calculators; Classroom Techniques; *Curriculum Development; Curriculum Enrichment; Discovery Learning; Educational Technology; Elementary Education; *Elementary School Mathematics; Evaluation Methods; Functions (Mathematics); Geometry; Lesson Plans; Mathematical Enrichment; Mathematical Logic; Mathematics Curriculum; Mathematics Education; *Mathematics Instruction; Number Concepts; Problem Solving; Teaching Methods; Units of Study
IDENTIFIERS	*Calculators and Mathematics Project CA; Mathematics Framework for Calif Public Schools; NCTM Curriculum and Evaluation Standards; Patterns (Mathematics)

ABSTRACT

The Calculators and Mathematics Project, Los Angeles (CAMP-LA), funded by the National Science Foundation for developing use of technology in the classroom, developed curriculum materials focused solely on the use of calculators in three stages. The first stage studied the mathematics curricula from different states and identified topics that are not included but should be if every student had a calculator, topics treated in too much detail, and topics no longer appropriate. Based on this information, CAMP-LA compiled a prototype curriculum organized by grade level to be consistent with the "California Mathematic Framework" strands. The second stage developed lessons by classroom teachers to cover the topics. The lessons were divided into four levels: Grades K-2, Grades 3-4, Grades 5-6, and Grades 7-8. The third stage field tested these lessons in various parts of the country. This book is composed of lesson samples from books 1-4 in the series. The introduction gives an overview of CAMP-LA, information on how to use the lesson plans, a glossary of calculator terminology, special features of the calculator, calculator limitations, and a discussion of assessment approaches, with sample assessment items appearing at the end of the book. The remainder of the book is composed of 16 lessons from the four levels. Each lesson is broken down into three sections. The three sections are labeled: "Grade", including grade level, strand, skill required, and purpose; "Management", including class organization, time frame, materials needed, vocabulary, and prerequisite skills; and "Lesson" including suggestions for directed instruction, guided practice, independent practice, evaluation, and home activity. (MDH)

ED342653

CAMP - LA

1234.5678
+/-
√
%
÷
MRC
M-
M+
x
7
8
9
-
4
5
6
+
1
2
3
=
ON/C
0
•

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Hani Sayegh

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

PRESERVICE
SAMPLER BOOK
GRADES K - 8

**Calculators and Mathematics Project,
Los Angeles (CAMP - LA)**

David Pagni, Editor
Cal State Fullerton Press

SE052574

BEST COPY AVAILABLE

CAMP-LA
SAMPLER
GRADES K - 8

CAMP-LA PROJECT STAFF

Co-director	David Pagni
Co-director	Robert Hamada
K - 2 Writing Team	Marea Channel
	Vicki Newman
3 - 4 Writing Team	Jan Christinson
	William Hammond
	Shirley Roberts
	Bruce Takashima
5 - 6 / 7 - 8 Writing Team	Zelda Gold
	Elisabeth Javor
	Steve Rosentsweig
K - 2 Spanish Translation	Fred Chavez
Production Typist and Computer Graphics	Donald Luey

Cal State Fullerton Press

Limited Reproduction Permission: Permission to duplicate these materials is limited to the teacher for whom they were purchased. Reproduction for an entire school or school district is unlawful and strictly prohibited. For conditions of use and permission to use materials contained herein for foreign publications or publications in other than the English language, apply either to the Publisher or the copyright owner. Publication pursuant to such permission shall contain the statement: "Some (All) of the materials incorporated in this Work were developed with the financial support of the National Science Foundation. Any opinions, findings, conclusions or recommendations expressed herein do not necessarily reflect the view of the National Science Foundation."

The following mathematics lessons were produced by the Calculators and Mathematics Project, Los Angeles (CAMP-LA). The project was supported by California State University, Fullerton, Los Angeles Unified School District and the National Science Foundation (Grant #MDR - 8651616). However, the opinions, findings, conclusions or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the National Science Foundation. The lessons were developed around mathematics topics that could be taught or enhanced with the use of a calculator. In some cases the calculator is used to explore or learn a mathematical concept; in other cases, it is used as a computing tool. All lessons were field-tested in the Los Angeles Unified School District in a wide variety of school settings. Sample lessons have been used in workshops for teachers and other mathematics educators across the United States. The CAMP-LA lessons have always been well-received. The directors and writers of CAMP-LA believe that you and your students will find these lessons to be fun and challenging!

The following lesson samples were selected from Books 1-4, representing examples from grades K-2, 3-4, 5-6, and 7-8. The lessons should give prospective elementary school teachers an appreciation of the mathematical content that lends itself to calculator use. Though this experience, prospective teachers will be better prepared to integrate calculators into the elementary school mathematics curriculum.

Copyright 1991 by Cal State Fullerton Press
All rights reserved.
Printed in the United States of America.
ISBN: 1-879853-08-6

ADDITIONAL ACKNOWLEDGMENTS

Advisory Board:

Art Hiatt, California State University, Fresno
Robert Reys, University of Missouri
Walter Szetela, University of British Columbia
Marilyn Suydam, Ohio State University
J. Fred Weaver, University of Wisconsin (Retired)

Field Testers:

Beverly Baba
Henry Behrens
Renee Boswell
Desdra Butler
Marjorie Champawat
Joan Douglas
Donna Edris
Susan L. Elms
Cheryl Eppink
Juliet Ethirveerasingam
Michael Gordon
Shirley Hirschfeld
Jean Huston
Yuki Ihara
Jackie Johnson
Joyce Kirsch
Elizabeth Lemons
Mary Major
Geraldean McDaniel
Polly McDowell
Feliciano Mendoza
Ellen Mitchell
Patti Poon
Irene Stewart
Lynn Tharsing
Mary Lou Vanderlip
Merrie Wartik
Audrey Washington
Diane Weinstein
Kimi N. Yasui

Consultants:

Karen Bachofer
Adriana Brady
Becky Breedlove
Marjorie Cochran
Dennis Dulyea
Ed Esty
Viggo Hansen
Claire Heidema
Chris Holle
Pat Johnson
Donna Jorgensen
Judith Koenig
Beatrice La Pisto
Kolburn Hughes
Patti McCullough
Terri Pagni
Karen Richey
Carolina Tercero

Books by David Pagni:

CAMP- LA Book 1

CAMP- LA Book 2

CAMP- LA Book 3

CAMP- LA Book 4

Math Lessons for Grades K - 3

Math Lessons for Grades 3 - 5

Math Investigations for the Months

PROJECT BACKGROUND

The Calculators and Mathematics Project, Los Angeles (CAMP-LA) was one of six projects[1] in the country funded by the National Science Foundation, Division of Materials Development and Research Instructional Materials Development Program, under a special program solicitation entitled "Materials for Elementary School Mathematics Instruction" in September, 1986. The special solicitation requested proposals that focused on the use of technology in elementary school mathematics.

Of these six projects, only CAMP-LA focussed its efforts soley on the use of calculators. The CAMP-LA philosophy is that every child should have access to a calculator at all times when investigating, studying, or learning mathematics.

The lesson development process spanned three stages. First, the project teams of writers and the two co-directors studied the mathematics curriculum guides from different states. They looked for:

- Topics not treated but which should be (assuming every child has a calculator)
- Topics treated in too much detail
- Topics no longer appropriate

Based on the results of this research, the CAMP-LA staff compiled a prototype curriculum organized around the strands of the *California Mathematic Framework*: Number, Measurement, Geometry, Patterns and Functions, Statistics and Probability, Logic, and Algebra. The CAMP-LA staff next isolated those topics that lent themselves to being taught with the use of a calculator. These topics were organized by grade level and became the CAMP-LA Calculator Continuum.

The second stage of the lesson development process was the writing of lessons that captured the essence of the Calculator Continuum. At this time, we decided to introduce a new strand, the Calculator Awareness strand for lessons designed to introduce students to the mechanics of operating a calculator. Of course, these lessons for introducing the calculator features are written in a mathematics context.

Drafts of lessons were written during the summer, 1987. During the following fall these skeletal lessons were evaluated to see which ones needed to be fleshed out, which needed to be deleted, and where in the Calculator Continuum additional lessons were needed.

The third stage of the CAMP-LA lesson development process was the field testing of the lessons. Because of a nationwide interest in the project, a few lessons were field tested in schools in various parts of the country. However, all lessons were field tested in the Los Angeles Unified School District in a variety of school settings. The CAMP-LA field test teachers turned in written reports including samples of students' work for each lesson. The field test teachers also met with the project writers to discuss the strengths and weaknesses of the various lessons. The field testing went hand - in - hand with new lesson development throughout 1988, 1989, and 1990. During the summer and fall of 1990 the writing teams completed their work and the final editing was completed by David Pagni, Principal Investigator and Co-director of CAMP-LA.

CAMP-LA Books

Book	Grade Level	Cost
Book 1	K – 2	$14.95
Book 2	3 – 4	$14.95
Book 3	5 – 6	$14.95
Book 4	7 – 8	$20.95

---

[1] The six NSF funded projects were:

1) "A Revision of the Geometry and Measurement Strands, K-6" University of Georgia

2) "Calculators and Mathematics Project, Los Angeles"
California State University, Fullerton

3) "Development of a Logo–Based Geometry Curriculum"
Kent State University

4) "K–6 Supplementary Mathematics Materials for a Technological Society"
New York University

5) "Reckoning with Mathematics: Tools and Challenges for the Information Age"
Education Development Center

6) "Used Numbers: Collecting and Analyzing Real Data"
Technical Education Research Centers

TABLE OF CONTENTS

Sampler

CAMP-LA Overview ix
Features of CAMP-LA Lessons x
Using The Lesson Plan xi
Calculator Glossary xiii
Calculator Features xiv
Calculator Limitations xv
CAMP-LA Assessment xvi

Featured Lessons

Lesson	Title	Objectives	Page
1	Hit The Target, Find The Winning Number	Use the constant feature to count by ones.	1
2	Discover and Compare	Identify patterns, count by multiples and compare number patterns.	8
3	It Counts	Count by numbers other than one to build the foundation for understanding the concept of multiples and remainders.	17
4	Multiple Applications	Find and name the multiples of a given number.	22
5	On Vacation We Go	Estimate and measure length in standard units.	26
6	Push "M" For Area	Estimate and find the area of polygons.	32
7	The Pencil Box Problem	Find a function rule from a situation or graph.	38
8	Big "D's" Parking Garage I	Use charts to organize information to solve simple logic problems.	46

9	Watch Your Money Grow	Problem solving exploration of powers using money as motivation.	55
10	Folding Paper	Fold paper to build an understanding of the area and perimeter of rectangles.	64
11	Going to the Movies	Explore combinations of different priced movie tickets to organize and interpret data.	68
12	Going Camping	Plan a camping trip as a group project.	73
13	Pardon My Dear Aunt Sally	Use the order of operations to compute.	81
14	An Ancient Oddity	Discover patterns on an ancient stone tablet.	87
15	Another Fence on the Wall	Investigate the area of rectangles under a unique condition.	94
16	This Lesson Rules!	A very challenging logic investigation using functions as a vehicle for exploration.	102
	Sample Assessment Items		112

CAMP-LA OVERVIEW

The **Calculators and Mathematics Project, Los Angeles (CAMP-LA)** provides materials for grades K-8 that integrate the calculator into the elementary school mathematics curriculum in a meaningful way.

CAMP-LA lessons support the philosophy expressed by the :

Mathematical Sciences Education Board
- **Everybody Counts**

National Council of Teachers of Mathematics
- **Agenda for Action,**
- **NCTM Standards**

California State Department of Education
- **Mathematics Framework**

CAMP-LA materials were written by classroom teachers and resource specialists. These materials are divided into four levels.

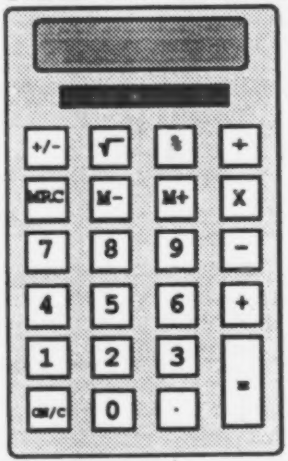
Grades K-2
Grades 3-4
Grades 5-6
Grades 7-8

The CAMP-LA lessons are based upon the strands of the California Mathematics Framework plus a special Awareness strand.

Calculator Awareness
Number
Measurement
Geometry
Patterns and Functions
Statistics and Probability
Logic
Algebra

Meaningful assessment of student understanding is provided for all levels.

CAMP-LA lessons use calculators with the following features:



- Constant function for basic operations
- Clear/ Clear entry key(s)
- Memory Keys
- Square Root Key
- % Key (Recommended by not essential)

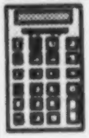
FEATURES OF CAMP-LA LESSONS

Calculators and Mathematics Project, Los Angeles Lessons:

- Provide a challenging currriculum based on the assumption that every child has access to a calculator.
- Help students become confident and comfortable using the calculator as an effective tool for exploring mathematical concepts.
- Develop students' ability to choose how and when to use a calculator.
- Assist students to make the connection between the concrete and the abstract.
- Emphasize conceptual development, reasoning, numerical relationships, and application in real-life experiences.
- Help students use the language, symbols, and processes of mathematics to gain confidence with numbers.
- Encourage the discovery of patterns in our number system.
- Remove computational constraints so that students can focus on the processes of solving problems and develop problem-solving skills and strategies.
- Provide students opportunities to reason logically and develop an intellectual curiosity toward mathematics.
- Stimulate interest in mathematics.
- Involve students in cooperative learning groups to solve problems.

USING THE LESSON PLAN

The first section of the lesson plan includes **TEACHER NOTES:**

CAMP-LA	**LESSON TITLE**
GRADE LEVEL:	Suggested grade levels are provided.
STRAND:	A content strand is identified (Calculator Awareness, Patterns and Functions, Number, or Algebra).
SKILL(S):	The specific mathematics skill(s) are identified.
MANAGEMENT CLASS ORGANIZATION:	Recommendations are made relating to group size (total class, small group, or pairs).
TIME FRAME:	A suggested time frame is provided to assist the teacher in scheduling.
MATERIALS: 	A list of materials is included. (Student Record Sheets and Home Activity Sheets are provided when appropriate.)
PREREQUISITE SKILLS:	Prerequisite skills are identified with reference to mathematical knowledge and mechanics of the calculator.

The second section of the lesson plan includes the **LESSON:**

LESSON

DIRECTED INSTRUCTION:	Lessons are sequentially developed and include background information and suggestions for delivery of instruction: • **Problem Solving** • **Concrete Materials** • **Cooperative Learning** • **Mathematical Language** • **Situational Lessons** Questions are provided to help the teacher: • Stimulate critical thinking • Focus on concepts to be developed • Encourage student involvement • Informally assess student progress Possible answers to questions are included to help the teacher guide the students in **understanding mathematical concepts** to be developed. Suggestions are provided to encourage **student involvement** and establish the teacher's role as facilitator.
GUIDED PRACTICE:	Students are provided practice under the teacher's guidance so that eventually they can apply their mathematical knowledge independently.
INDEPENDENT PRACTICE:	**Student Record Sheets** are provided to reinforce mathematical concepts. (**Answer Keys** are included.) There is a separate record sheet for each grade level when appropriate.
EVALUATION:	A variety of evaluation methods are used to: • Assess students' understanding of mathematical concepts. • Judge whether the use of the calculator was effective and efficient in solving the problems. • Bring mathematical closure to the lesson.
HOME ACTIVITY EXTENSION:	**Home Activity Sheets** and suggestions for **Extension Activities** provide additional opportunities to apply mathematical concepts in various situations.

CALCULATOR GLOSSARY

=	**Equal Key** - Press this key to get the answer on the display. Also used to repeat a given function, such as addition.
ON/C	**On/Clear Key** - A key that turns on the calculator. Often this key is used to clear the calculator display.
M+	**Memory Plus Key** - A key used to add the number in the display to the memory.
M-	**Memory Minus Key** -A key used to subtract the number in the display from the memory.
MRC	**Memory Recall/Memory Clear Key** - Press this key once to display the number stored in the memory. Press this key twice to clear the memory.
√‾	**Square Root**- A key used to tell the calculator to perform a square root.
%	**Percent Key** - A key used to compute percents of a number.
+/_	**Change Sign Key** - A key used to change the sign of a number.

CALCULATOR FEATURES

Addition Constant

Press: $\boxed{8}$ $\boxed{+}$ $\boxed{5}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$

Look at the display as you continue to press $\boxed{=}$. On most calculators the display will show $\boxed{13}$, $\boxed{18}$, $\boxed{23}$, ... Each time you press $\boxed{=}$, 5 is added to the number shown on the display. This is called the addition constant function.

Subtraction Constant

Press: $\boxed{80}$ $\boxed{-}$ $\boxed{5}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$

Look at the display as you continue to press $\boxed{=}$. On most calculators the display will show $\boxed{75}$, $\boxed{70}$, $\boxed{65}$, ... Each time you press $\boxed{=}$, 5 is subtracted to the number shown on the display. This is called the subtraction constant function.

Division Constant

Press: $\boxed{8}$ $\boxed{\div}$ $\boxed{2}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$

Look at the display as you continue to press $\boxed{=}$. On most calculators the display will show $\boxed{40}$, $\boxed{20}$, $\boxed{10}$, ... Each time you press $\boxed{=}$, the number on the display is divided by 2. This is called the division constant function.

Multiplication Constant

Press: $\boxed{2}$ $\boxed{x}$ $\boxed{3}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$

Look at the display as you continue to press $\boxed{=}$. On most calculators the display will show $\boxed{6}$, $\boxed{12}$, $\boxed{24}$, ... Each time you press $\boxed{=}$, the number on the display is multiplied by 2. This is called the multiplication constant function.

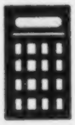
CAMP-LA ASSESSMENT

The purpose of assessment is to enhance learning and improve teaching. For the student, assessment indicates a measure of mathematical knowledge and power. For the teacher, it indicates how the instructional program should be modified. Teacher observation of students' actions and interactions gives information about mathematical knowledge, understanding of concepts, and ability to apply reasoning and analysis to solve problems.

Sample **CAMP-LA** assessment items appear at the end of this book. The assessment items:

- have been written as models of assessment which support the major concepts presented in the **CAMP-LA** lessons;
- provide both open-ended and traditional assessment tasks;
- are meant to be done by pairs and/or small groups;
- indicate anticipated student responses for open-ended questions.

HIT THE TARGET, FIND THE WINNING NUMBER

GRADE:	K - 2
STRAND:	CALCULATOR AWARENESS
SKILL:	Exploring the calculator: To use the constant feature to count by ones.
MANAGEMENT: CLASS ORGANIZATION:	Total class
TIME FRAME:	Half-hour
MATERIALS: 	• Overhead calculator or calculator transparency • Calculator for each student • Hit the Target, Find the Winning Number Record Sheet (Kdgn, First, Second and the blank form) • Pencil
VOCABULARY:	Constant feature, symbol
PREREQUISITE SKILLS:	One-to-one correspondence, identify numbers 0-9, count in sequence.

LESSON

- **DIRECTED INSTRUCTION:**

  The procedures for using the constant feature may differ among calculators. Alter the directions if necessary.

1. Follow these steps

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
	How many different ways can we count the number of students in this classroom?	Students brainstorm ideas: Count out loud. Count people. Use the calculator.	
Distribute a calculator to each student and place the overhead calculator on the projector.			
"Today let's try using the calculator to count the number of students in our class."	What number should we start with when we count?	one	
I'll press [+] , [1] and then [=].	What number do you see on my display screen?	1	Press [+] , [1], and then read the display. [1]
Walk around the room and clap once each time while walking by a child until all students have been counted.			Each time the teacher claps, press [=] and read the number on the display.
Record the total number of students on the chalkboard.			

2. Follow these steps for discussion:

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
	What happened each time you pressed the [=] key?	The number got bigger by one.	
The [=] can be a counting key.	How did we use the [=] to help us count?	• Press [+] • Press [1] • Press [=] • Continue pressing [=] to count.	

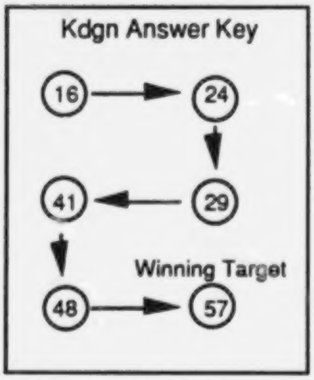
- **GUIDED PRACTICE:**

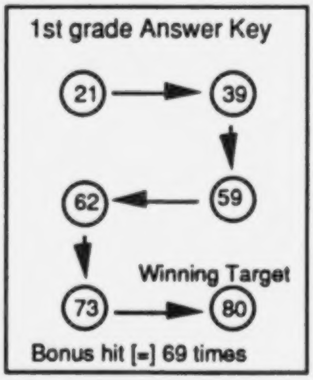
3. Use the [=] to count to 50. (Have Kdgn students read each number orally. First and second graders can read the numbers silently.)

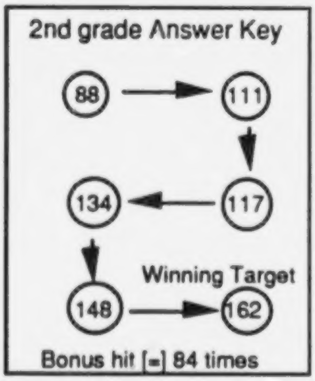
4. Write a two or three digit "Target Number" on the chalkboard and have students press [+] [1] [=] and continue pressing [=] until the "Target Number" appears on their calculator display.

5. Write a starting number such as 6 and a "Target Number" and have students press [6] [+] [1] [=] and continue pressing [=] until the "Target Number" appears on their calculator display.
   This will give students practice with counting on.

- **INDEPENDENT PRACTICE:**
  1. Use the Hit the Target, Find the Winning Number Record Sheet. (Kdgn, 1st and 2nd)
     - ***Encourage students to predict their target numbers before hitting the [=].***

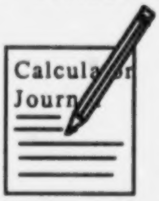

Kdgn Answer Key
16
24
29
41
48
Winning Target
57


1st grade Answer Key
21
39
59
62
73
Winning Target
80
Bonus hit [=] 69 times


2nd grade Answer Key
88
111
117
134
148
Winning Target
162
Bonus hit [=] 84 times

  2. Students can design their own Hit the Target, Find the Winning Number Record Sheet using the blank form. (Count by ones, twos, threes, fours, etc. See EVALUATION section.)

- **EVALUATION:**


Calculator
Journal

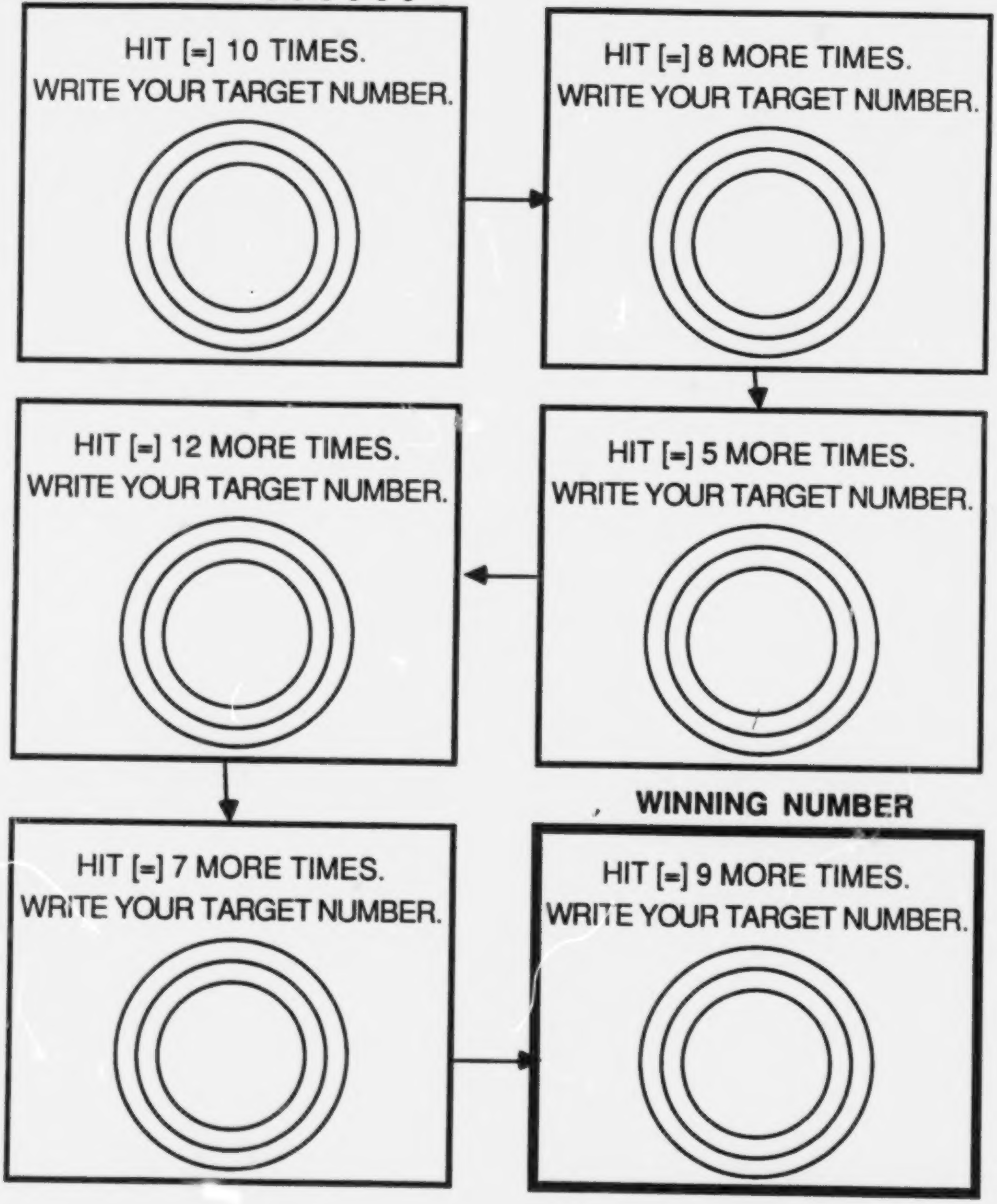
Ask students how they could use the calculator to count by 2, 3, etc.? See if they can come up with a system to make this discovery. (To count by 2, press [+], [2], [=], [=], etc.)

- **HOME ACTIVITY:**
  Count other things using the calculator such as trees, pets, houses etc.

NAME____

HIT THE TARGET, FIND THE WINNING NUMBER - KDGN

START: PRESS [6] [+] [1]



HIT [=] 10 TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 8 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 5 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 12 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 7 MORE TIMES.
WRITE YOUR TARGET NUMBER.

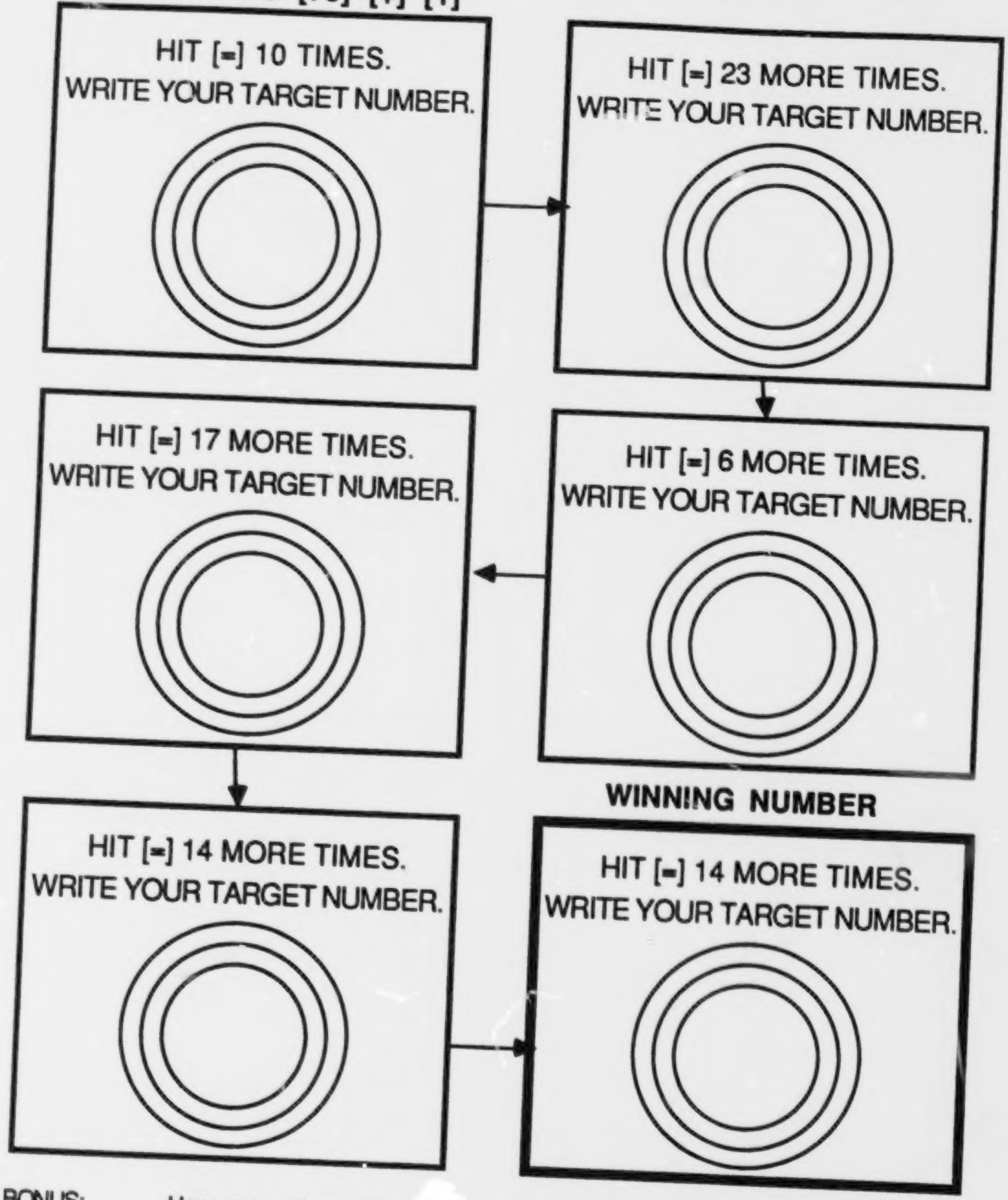
WINNING NUMBER

HIT [=] 9 MORE TIMES.
WRITE YOUR TARGET NUMBER.

NAME____

HIT THE TARGET, FIND THE WINNING NUMBER - 2ND

START: PRESS [78] [+] [1]



HIT [=] 10 TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 23 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 6 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 17 MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] 14 MORE TIMES.
WRITE YOUR TARGET NUMBER.

WINNING NUMBER

HIT [=] 14 MORE TIMES.
WRITE YOUR TARGET NUMBER.

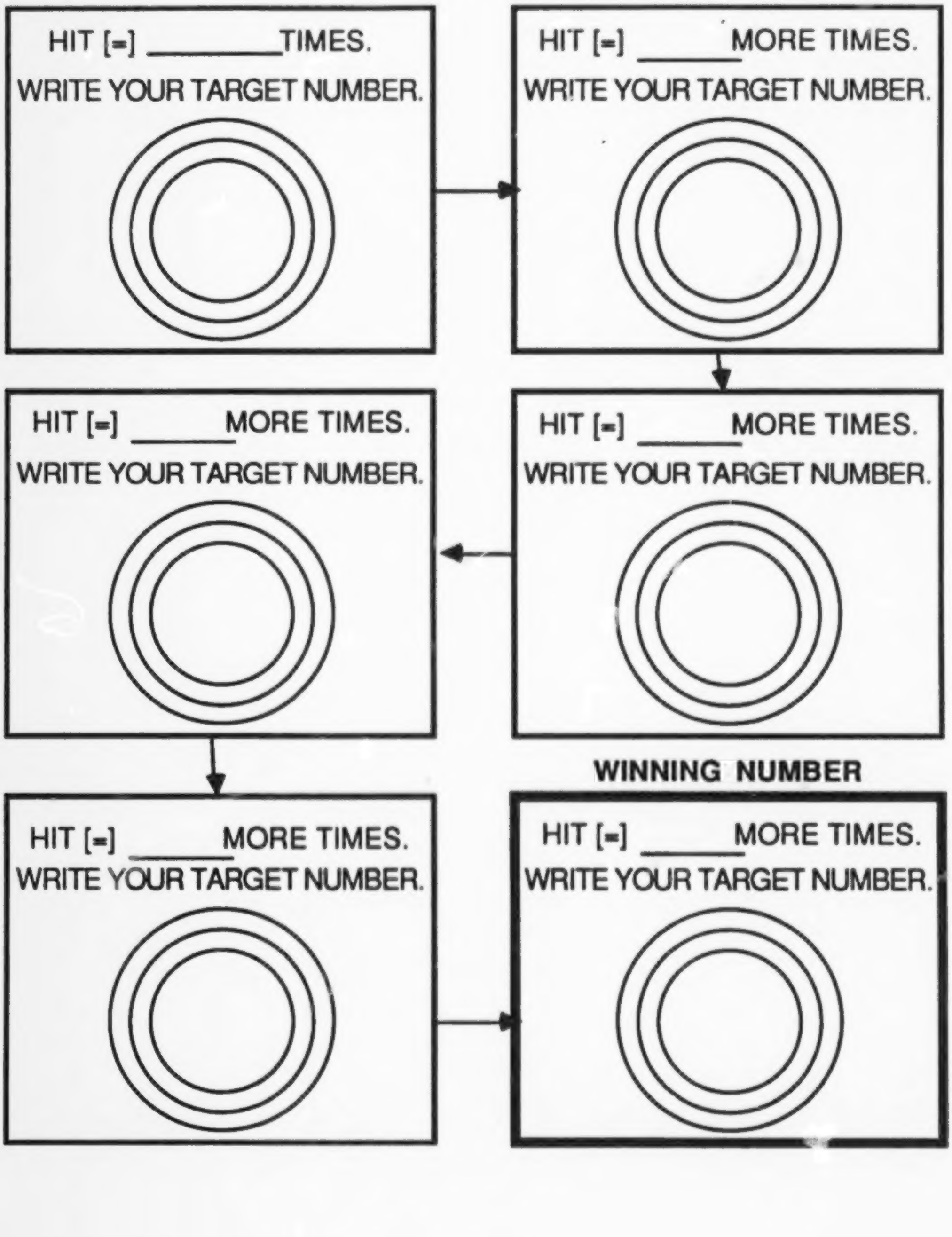
BONUS: How many times did you hit [=] altogether to get your winning number?

____

NAME____

HIT THE TARGET, FIND THE WINNING NUMBER

START: PRESS [ ] [+] [ ]



HIT [=] ________TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] ______MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] ______MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] ______MORE TIMES.
WRITE YOUR TARGET NUMBER.

HIT [=] ______MORE TIMES.
WRITE YOUR TARGET NUMBER.

WINNING NUMBER

HIT [=] ______MORE TIMES.
WRITE YOUR TARGET NUMBER.

DISCOVER AND COMPARE

GRADE: K - 2

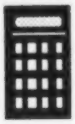
STRAND: PATTERNS AND FUNCTIONS

SKILL: Identify patterns, count by multiples and compare number patterns.

MANAGEMENT
CLASS ORGANIZATION: Total class

TIME FRAME: Half-hour

MATERIALS:



- Overhead calculator or calculator transparency
- Calculator for each student
- Discover and Compare transparency
- Overhead pen
- Record Sheets
    - Discover and Compare Two Number Patterns (Kdgn)
    - Discover and Compare Four Number Patterns (1st)
    - Discover and Compare Six Number Patterns (2nd)
- Home Activity - (Optional)
- Pencil

VOCABULARY: Compare, alike, different

PREREQUISITE SKILLS: Use of constant feature : [C] [+] [3] [=] [=], completion of Lesson 15

LESSON

- **DIRECTED INSTRUCTION:**

1. Teacher says: "We've been counting by different numbers and today we're going to compare different number patterns."
2. Follow these steps:

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
Distribute a calculator to each student and place the overhead calculator and Discover and Compare transparency on the projector. Choose one student to use the overhead calculator and color in the numbers on the Discover and Compare transparency.	How can we use the calculator to count by 3's?	[C] [+] [3] [=] [=]	Press [C] [+] [3] [=] [=]

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
Tell the recorder to color in the number 3 on the Discover and Compare transparency.			
Each time a new number appears on their calculator display, have students say the number orally so the recorder can color on the Discover and Compare Chart. (Say "press" each time students need to press the [=] so that the class stays together.) At some point, when the pattern becomes visible on the overhead ask this question:	Can you predict the next number in the pattern without using your calculator?	Accept all reasonable answers.	Continue to 100.
Follow the same steps to count by 5's.			
After both charts have been completed, have students describe each pattern and compare likenesses and differences.			

Possible Descriptions:

3's	5's
• Diagonal lines. 2 spaces between the numbers colored.	• Straight lines. • 4 spaces between the numbers colored.
• Number of boxes colored in each row or column follow this pattern: 3, 3, 4.	• All the numbers end with 5 or 0 (All the numbers have 5 or 0 in the ones place.)
• Different lengths for each diagonal line.	• Both lines are the same length.

Discover and Compare Answer Key

COUNT BY 3'S

LEAVES ON A SHAMROCK

1	2	③	4	5	⑥	7	8	⑨	10
11	⑫	13	14	⑮	16	17	⑱	19	20
㉑	22	23	㉔	25	26	㉗	28	29	㉚
31	32	㉝	34	35	㊱	37	38	㊴	40
41	㊷	43	44	㊺	46	47	㊽	49	50
(51)	52	53	(54)	55	56	(57)	58	59	(60)
61	62	(63)	64	65	(66)	67	68	(69)	70
71	(72)	73	74	(75)	76	77	(78)	79	80
(81)	82	83	(84)	85	86	(87)	88	89	(90)
91	92	(93)	94	95	(96)	97	98	(99)	100

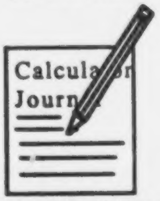
COUNT BY 5'S

FINGERS ON A HAND

1	2	3	4	⑤	6	7	8	9	⑩
11	12	13	14	⑮	16	17	18	19	⑳
21	22	23	24	㉕	26	27	28	29	㉚
31	32	33	34	㉟	36	37	38	39	㊵
41	42	43	44	㊺	46	47	48	49	㊿
51	52	53	54	(55)	56	57	58	59	(60)
61	62	63	64	(65)	66	67	68	69	(70)
71	72	73	74	(75)	76	77	78	79	(80)
81	82	83	84	(85)	86	87	88	89	(90)
91	92	93	94	(95)	96	97	98	99	(100)

- **GUIDED PRACTICE:**
  Use the Discover and Compare Record Sheets (Kdgn, First or Second).

- **EVALUATION:** How are your patterns alike? How are they different?



- **HOME ACTIVITY:**
  Students need 2 copies of the Home Activity so they can compare patterns.

* The number chart on this page is a multiplication table rather than a hundreds chart. This will allow students to explore different patterns.

26

COUNT BY 3'S

LEAVES ON A SHAMROCK

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

COUNT BY 5'S

FINGERS ON A HAND

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

NAME____

DISCOVER AND COMPARE TWO NUMBER PATTERNS - K

DIRECTIONS: Color in the numbers to show how you counted by:

__________________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

NAME____

DISCOVER AND COMPARE FOUR NUMBER PATTERNS - 1ST

DIRECTIONS: Color the numbers that show how you counted by:

________________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

________________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

________________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

________________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	[illegible]	90
91	92	93	94	95	96	97	98	99	100

How are your patterns alike?

How are they different?

NAME ______________________________

DISCOVER AND COMPARE SIX NUMBER PATTERNS - 2ND

Directions: Color in the numbers to show how you counted by:

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

______________'S

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

How are your patterns alike?
How are they different?

NAME ____

DISCOVER AND COMPARE - HOME ACTIVITY

1. Choose a number from 1 to 12. Write it in this box and in the first box on the chart below.
2. Count by that number using your calculator.
3. Each time you see a new number on the display, record it on the chart.
4. Stop when you get to or past 144.

5. Color in the squares on the chart below for each number that you wrote. You might find a number more than once.
6. Look for a pattern.
7. Tell about your pattern.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

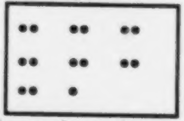
IT COUNTS

GRADE:	K - 2
STRAND:	Number
SKILL:	Count by numbers other than one to build the foundation for understanding the concept of multiples and remainders.
MANAGEMENT **CLASS ORGANIZATION:**	Total class, pairs
TIME FRAME:	Half-hour
MATERIALS:	For each pair of students: • Calculator • 15 counters • It Counts Record Sheet • Pencil • Calculator Race Record Sheet (Kdgn or 1st/2nd) • Calculator Race Home Activity (optional)
VOCABULARY:	No new vocabulary
PREREQUISITE SKILLS:	Completion of Lessons 1 - 5 and Lessons 13 - 16

LESSON

- **DIRECTED INSTRUCTION:**

1. Follow these steps.

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
Distribute a calculator, 15 counters and the **It Counts** Record Sheet to each pair of students.			
Ask these questions:	How can we use the calculator to count by twos?	[C] [+] [2] [=] [=]	
	Do you think you can make the number 15 appear on your display if you count by twos?	Accept a "yes" or "no" answer at this time because students are making a prediction.	**Investigate:** • Press [+] • Press [2] • Press [=] • Continue pressing [=] to see if 15 will appear on the display. * Students will discover that it is impossible to count by twos to fifteen.
	What happened when you used the calculator to count by twos?	Accept all reasonable answers.	
	Why couldn't you make 15 appear on the display when you counted by twos?	Students brainstorm ideas.	
Let's use counters to help us discover why we couldn't make 15 appear on the display when we counted by twos.			• Use the counters to count by twos.  • Record on the **It Counts** Record Sheet while counting by twos. • Count by twos. 1 ② 3 ④ 5 ⑥ 7 ⑧ 9 ⑩ 11 ⑫ 13 ⑭ 15 * One student can use the counters while the other student records. • Explain the results of the investigation.

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
	What happened when you used the counters to count by twos?	Accept all reasonable answers.	
	Why couldn't you count to 15 by twos?	We had one counter left over so we couldn't make equal groups of two.	
* With first and second graders you may want to introduce the term: remainders.			
Ask these questions:	What was the pattern on your record sheet?	Every other number was circled.	
	Why didn't you circle the number fifteen?	Because it wasn't part of the pattern and it's not a number that you get when you count by equal groups of two.	
* You may want to mention that all of the numbers circled are multiples of 2.			

* Optional

- **GUIDED PRACTICE:**

2. Teacher says, "You used the calculator, counters, and number patterns to find out if you could count by twos to 15. Now you can investigate other numbers to see if you can count to 15."
3. Follow these steps.

TEACHER DIRECTIONS	ASK THESE QUESTIONS	POSSIBLE ANSWERS	STUDENT DIRECTIONS
Tell each pair of students to experiment with different numbers until they find one that they can use to count to 15.	Do you think there will be more than one number?	Accept a "yes" or "no" answer at this time because students are making a prediction.	**Investigate:** • Use the calculator or counters and record results on the It Counts Record Sheet. • Continue using different numbers until a solution is found. Answer: 3 and 5. • Discuss results.

- **INDEPENDENT PRACTICE:**

  A Calculator Race Record Sheet is provided for further investigations.

- **EVALUATION:**
  - What numbers can you count by to reach 18? (1, 2, 3, 6, 9)
  - Why do you think you can count by 3 and 6 to reach 18?
  - Why couldn't you count by 4 to reach 18?
  - How did the calculator help you count?
  - What mathematics did you learn?

- **HOME ACTIVITY:**

  The Calculator Race Home Activity is provided for you to create your own record sheet. Choose any numbers appropriate for your students.

NAME ____________________

IT COUNTS

Can you count to 15?

Directions: Circle the number as you count by 2. Circle yes or no to answer the question.
Then choose 2 different numbers and follow the same steps.

Count by 2

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

yes

no

Count by ☐

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

yes

no

Count by ☐

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

yes

no

NAME ____________________

CALCULATOR RACE

KDGN

WHO WILL WIN THE RACE?

DIRECTIONS: Use the calculator to count. Circle the numbers you can count by to reach the finish line.

3

4

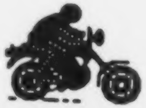
5

FINISH LINE

75

2

3



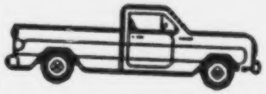
4

6

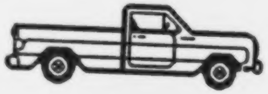
8

FINISH LINE

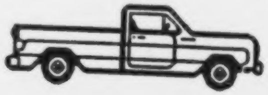
24



4



5



7

10

FINISH LINE

100

NAME ____________________

CALCULATOR RACE

1st/2nd

WHO WILL WIN THE RACE?

DIRECTIONS: Use the calculator to count. Circle the numbers you can count by to reach the finish line.

2 5 12 11 10

FINISH LINE

110

2 3 11 22 33

FINISH LINE

99

25 35 50 100 300

FINISH LINE

2000

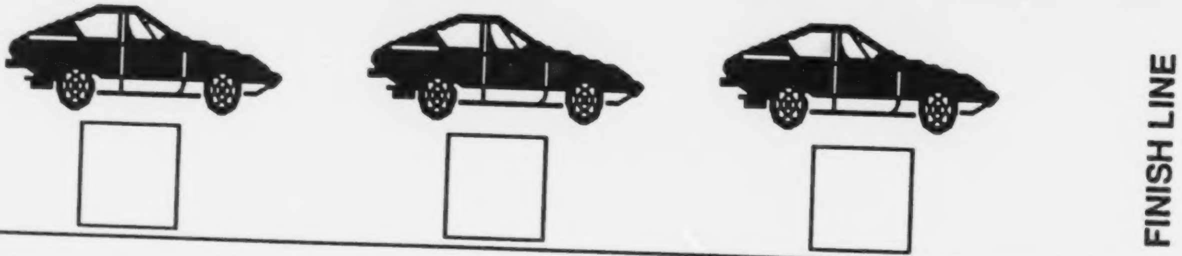
NAME ____________________

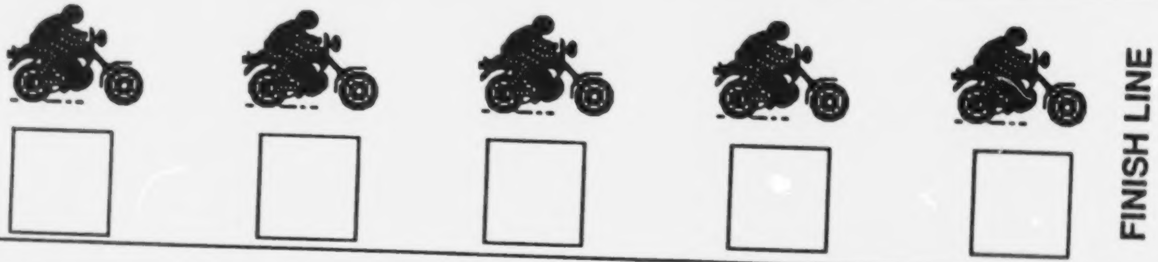
CALCULATOR RACE

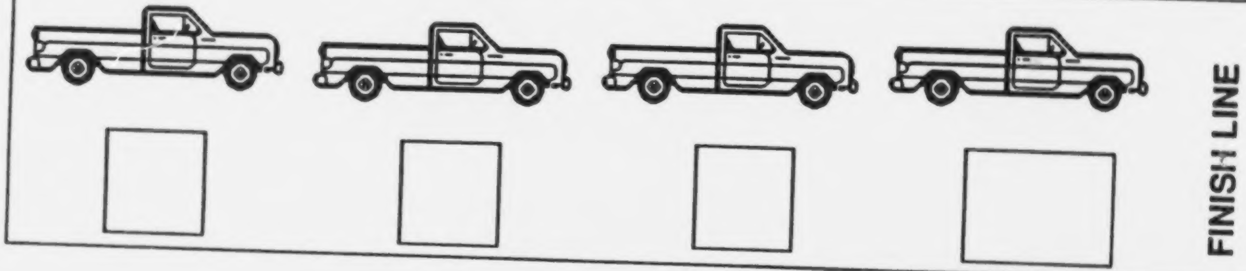
KDGN

WHO WILL WIN THE RACE?

DIRECTIONS: Use the calculator to count. Circle the numbers you can count by to reach the finish line.


FINISH LINE


FINISH LINE


FINISH LINE

HOME ACTIVITY

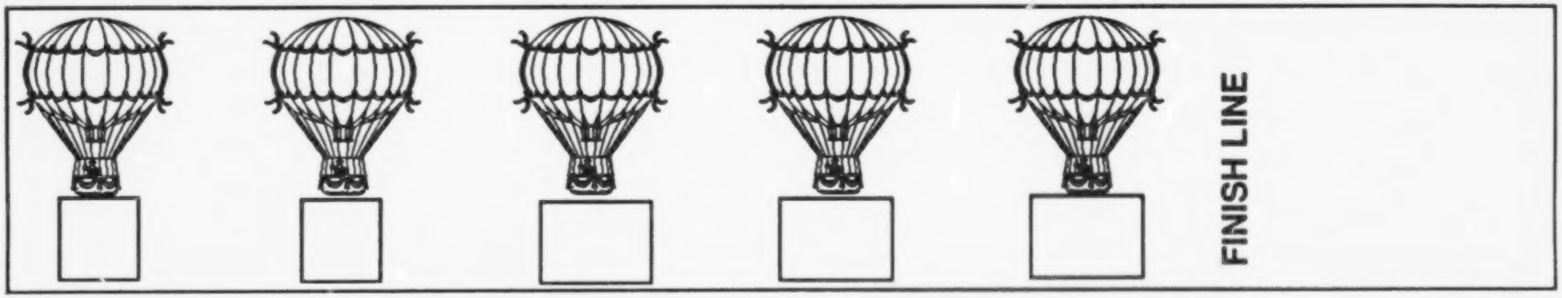
NAME ____________________

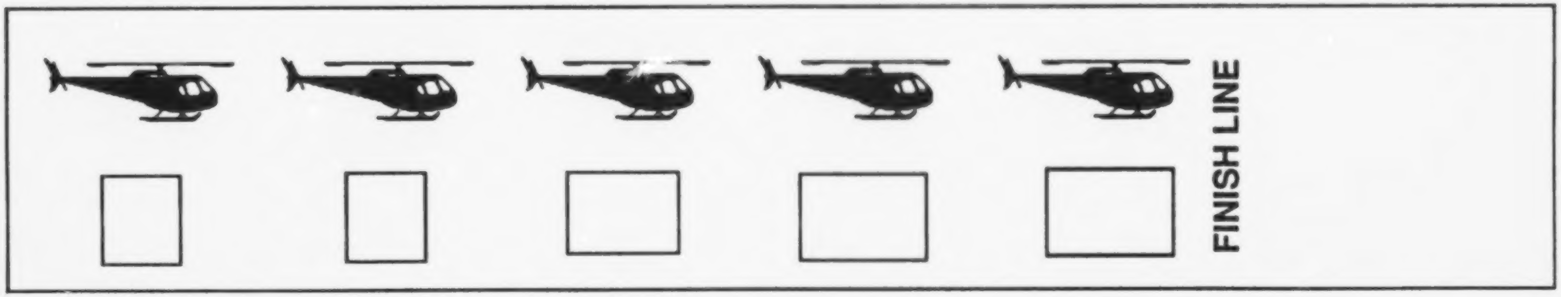
CALCULATOR RACE

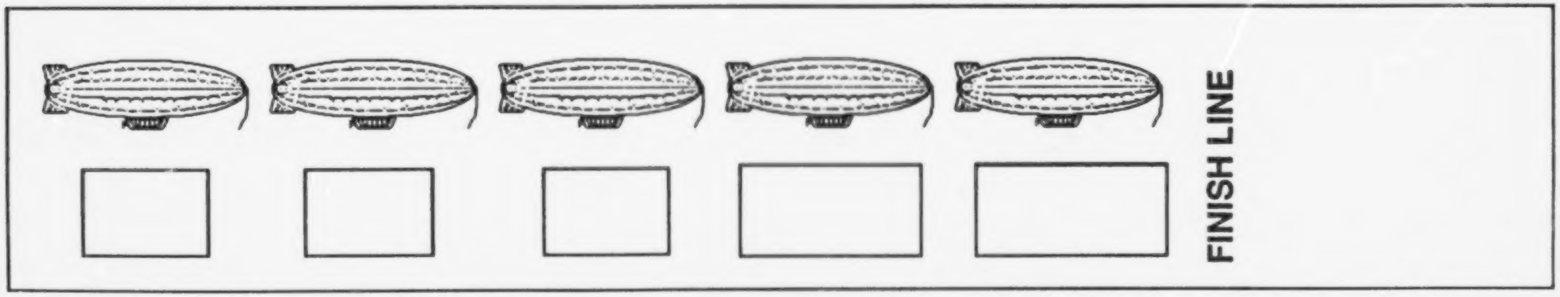
1st/2nd

WHO WILL WIN THE RACE?

DIRECTIONS: Use the calculator to count. Circle the numbers you can count by to reach the finish line.


FINISH LINE


FINISH LINE


FINISH LINE

MULTIPLE APPLICATIONS

GRADE: 3 - 4

STRAND: NUMBER

SKILL: Find and name the multiples of a given number.

PURPOSE: To practice finding multiples of a number using constant key

MANAGEMENT

CLASS ORGANIZATION: Pairs

TIME FRAME: One class period

MATERIALS: Calculators

VOCABULARY: Multiples, constant

PREREQUISITE SKILLS: Mathematics: Basic operations
Calculator: Basic functions

LESSON The purpose of this lesson is to use the constant counting feature of the calculator.

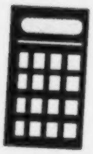
- **DIRECTED INSTRUCTION:**
  Discuss the meaning of multiples. Explain that you can obtain multiples of a number on most calculators by pressing $\boxed{C}$ $\boxed{+}$ [number] $\boxed{=}$, then continue pressing the $\boxed{=}$ key. Use the calculator to find 6 multiples of 5 by pressing $\boxed{C}$ $\boxed{+}$ $\boxed{5}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$.

- **GUIDED PRACTICE:**
  Have students find several multiples for 3, 6, and 11. As they are working, have students predict multiples before pressing the = sign.

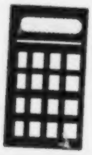
- **INDEPENDENT PRACTICE:**
  Complete the Student Activity Sheet.

- **EVALUATION:**
  Check the Student Activity Sheet.

- **HOME ACTIVITY:**
  Demonstrate the constant feature of the calculator to your family.



MULTIPLE APPLICATIONS
Student Activity Sheet



Find the missing numbers by using the calculator to find multiples of the first number.

1. 2, 4, 6, ______,10, ______ ,14,______, ______

2. 7, 14, ______ ,28, ______, 42, ______, ______, ______, ______,77

3. 12, 24,______, ______, 60, ______, ______, 96,______, ______,

   132, ______, ______, 168

4. 15,______,______,______ , ______, ______, ______, 120

5. 1,______, ______, ______, ______, ______, ______, ______

6. 78,______,______,______,______ ,______

Use multiples to solve these problems.

7. Sam and his brother are both between the ages of 35 and 50. Sam is older than his brother. Both of their ages are multiples of 8. How old is Sam? How old is his brother? ____________________.

8. Jeff is between 46 and 60 inches tall. His height is a multiple of 9. How tall is Jeff? ____.

9. Mary has between 50 and 65 books in her room. The number of books is a multiple of both 4 and 5. How many books does Mary have? ___________

10. Julie and Stan collected between 30 and 60 pounds of aluminum cans for the school can drive. The number of pounds of cans is a common multiple of 4, 6, and 8. How many pounds of cans did they collect? ________

BEST COPY AVAILABLE

MULTIPLE APPLICATIONS
Teacher Answer Sheet

1. 2, 4, 6, 8, 10, 12, 14, 16, 18
2. 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77
3. 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168
4. 15, 30, 45, 60, 75, 90, 105, 120
5. 1, 2, 3, 4, 5, 6, 7, 8
6. 78, 156, 234, 312, 390, 468
7. Sam 48, Brother 40
8. 54 inches tall
9. 60 books
10. 48 pounds

ON VACATION WE WILL GO

GRADE: 3 - 4

STRAND: Measurement

SKILL: Estimate and measure length in standard units

MANAGEMENT
CLASS ORGANIZATION: Whole class and pairs

TIME FRAME: Two class periods

MATERIALS: Ruler, calculator, map, transparency, clear ruler

VOCABULARY: Scale, conversion, route

PREREQUISITE SKILLS: Mathematics: Basic operations
Calculator: Basic functions

LESSON

The purpose of this lesson is to have the students use a map, scale, and a calculator to determine distance.

- **DIRECTED INSTRUCTION:**

Day One

"How many of you have seen your parents use a road map? Why do we use a map?" Discuss how to use a map to plan a route of travel.
Project a transparency of the map. Use a transparent ruler to demonstrate how to measure the distance from home to the mountains on the map. Show how to label the inches on the map. Students use their ruler and map to measure and record the distance from home to mountains.

Next measure from the stadium to the mountains on the transparency. Then have the students record the distance as 2.5 inches on their map. Tell students that .5 = 1/2 and that on this lesson they only need to measure to the nearest 1/2 inch mark or full inch mark (we say we are measuring to the nearest half inch).

- **GUIDED PRACTICE:**

Students measure and record several distances on the map. You may want to develop a story to tell why you are going certain places on the map.

- **INDEPENDENT PRACTICE:**

Students complete all measurements on the map.

- **EVALUATION:**

Check students' measurements on map.

Day Two

- **DIRECTED INSTRUCTION:**

Look at the distance between the home and the mountains. Is two inches actually 28 miles on this map? Discuss models and scales (1 in. = 14 miles).

The next two calculations can be done mentally.
Demonstrate how to convert the 2 inches from the home to the mountains into 28 mi. by adding 14 miles for each inch.

Demonstrate how to convert the distance between the mountains to the stadium by adding 14 miles for each inch and 7 miles for each 1/2 inch. [**answer:** 2.5" = 35mi.]

Students use a calculator to do the second conversion: $2.5\boxed{x}14\boxed{=}35$.

Discuss the most efficient way to do the conversion: addition or multiplication.

- **GUIDED PRACTICE:**

Do 3 or 4 conversions and record the miles on the map.

- **INDEPENDENT PRACTICE:**

Students work with a partner to complete the student activity sheet using the map and a calculator.

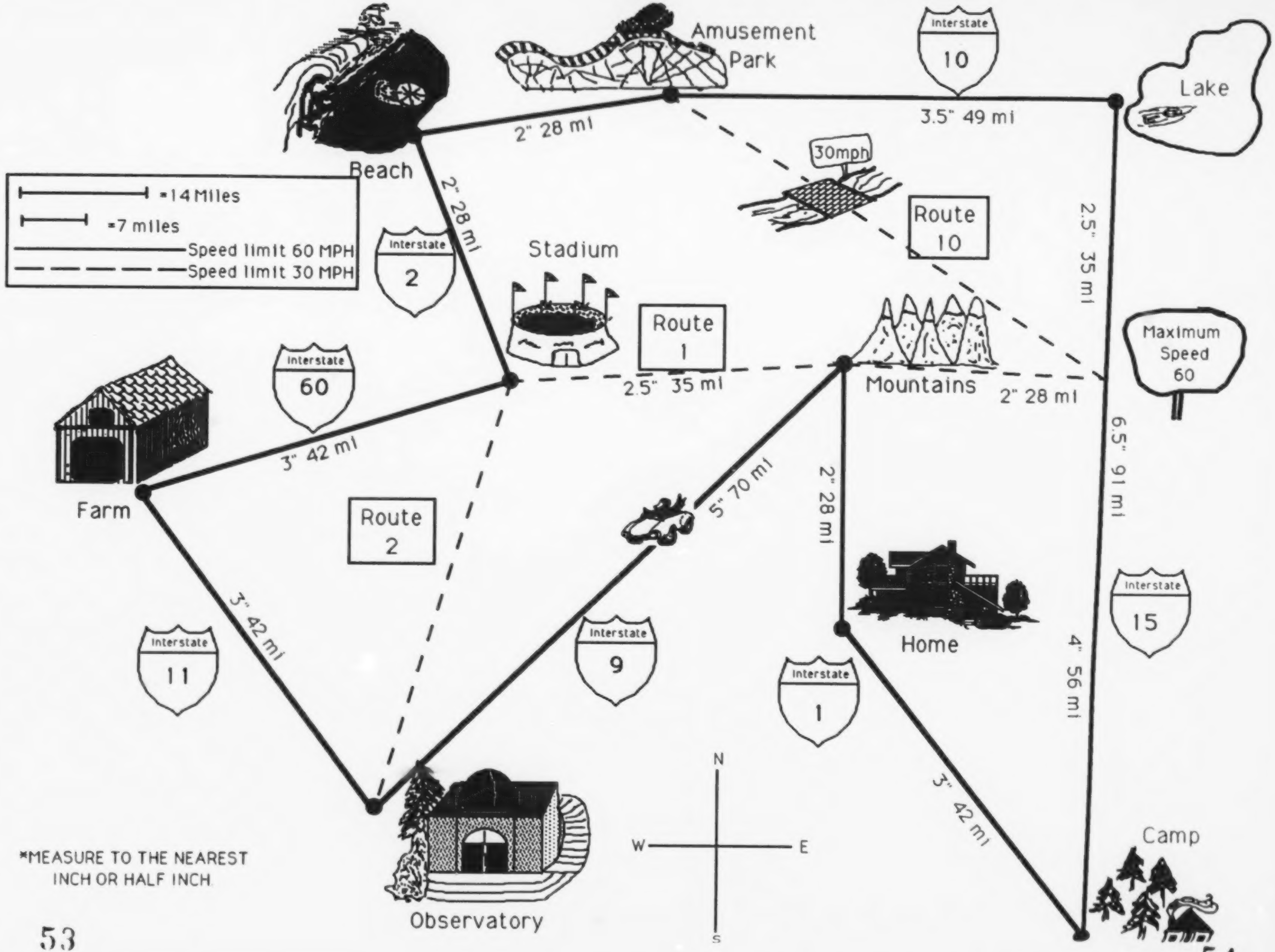
- **EVALUATION:**

Check the answers on the students' charts.

- **HOME ACTIVITY:**

Write a letter to a friend describing:
- Where you went
- What you did
- The route you took
- How far you traveled

Students designate their own routes and find the total distance.



Amusement Park
Interstate 10
Lake
Beach
2" 28 mi
3.5" 49 mi
30mph
▬ =14 Miles
▬ =7 miles
Speed limit 60 MPH
Speed limit 30 MPH
2" 28 mi
Interstate 2
Stadium
Route 10
2.5" 35 mi
Route 1
Interstate 60
2.5" 35 mi
Mountains
2" 28 mi
Maximum Speed 60
3" 42 mi
6.5" 91 mi
Farm
Route 2
5" 70 mi
2" 28 mi
3" 42 mi
Interstate 11
Interstate 9
Home
Interstate 15
Interstate 1
4" 56 mi
N
W
E
S
3" 42 mi
Camp
Observatory

*MEASURE TO THE NEAREST INCH OR HALF INCH.

ON VACATION WE WILL GO

Student Activity Sheet

Use the map and a calculator to find the total miles for each trip.

From	Destination	Route	Miles
CAMP	FARM	I1 - I9 - I11	
FARM	LAKE	I60 - R1 - I15	
LAKE	BEACH	I15 - R1 - I2	
FARM	HOME	I60 - R1 - I1	
OBSERVATORY	AMUSEMENT PARK	I9 - R1 - R10	

Use the map and a calculator to determine the route that matches the total miles.

From	Destination	Route	Miles
LAKE	OBSERVATORY		231
CAMP	BEACH		266
BEACH	HOME		91
STADIUM	CAMP		343
HOME	AMUSEMENT PARK		350

ON VACATION WE WILL GO

Teacher Answer Sheet

From	Destination	Route	Miles
CAMP	FARM	I1 - I9 - I11	182
FARM	LAKE	I60 - R1 - I15	140
LAKE	BEACH	I15 - R1 - I2	126
FARM	HOME	I60 - R1 - I1	105
OBSERVATORY	AMUSEMENT PARK	I9 - R1 - R10	154

From	Destination	Route	Miles
LAKE	OBSERVATORY	I15 - I1 - I9	231
CAMP	BEACH	I15 - R1 - I9 -I11- I60 - I2	266
BEACH	HOME	I2 - R1 - I1	91
STADIUM	CAMP	R2-I9-R1-R10-I10- I15	343
HOME	AMUSEMENT PARK	I1-I15-R1-R2-I11- I60-I2-I10	350

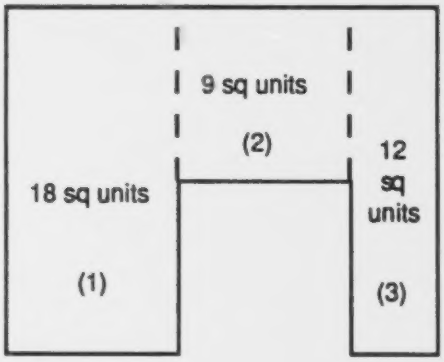
PUSH "M" FOR AREA

GRADE:	3 - 4
STRAND:	Geometry
SKILL:	Estimate and find the area of polygons
MANAGEMENT **CLASS ORGANIZATION:**	Pairs
TIME FRAME:	One class period
MATERIALS:	Calculator, ruler, transparency
VOCABULARY:	Area, dimensions, polygon, regular, irregular, memory, recall, decimeter
PREREQUISITE SKILL:	Mathematics: Basic operations, area of rectangular polygons Calculator: Basic functions, memory feature

LESSON The purpose of this lesson is to have the students find the area of irregular polygons.

- **DIRECTED INSTRUCTION:**

Project Transparency 1.
Review how to compute the area of a rectangle.
Area = Length x Width
Demonstrate how to find the area of a irregular polygon on the transparency. Partition the irregular polygon into rectangular regions. Find the area of each rectangular region. Use the memory feature of the calculator to find the total area of the irregular polygon.



MRC MRC C
6 x 3 M+
3 x 3 M+
6 x 2 M+
MRC display 39

- **GUIDED PRACTICE:**

  Project Transparency 2.

  Distribute Student Activity Sheet 1. Determine the area of the irregular polygon with the students. [**answer:** 42 sq. units]

- **INDEPENDENT PRACTICE:**

  Distribute Student Activity Sheet 2.

  Students work in pairs to complete the activity. [**answer:** 16848 sq. in.]

- **EVALUATION:**

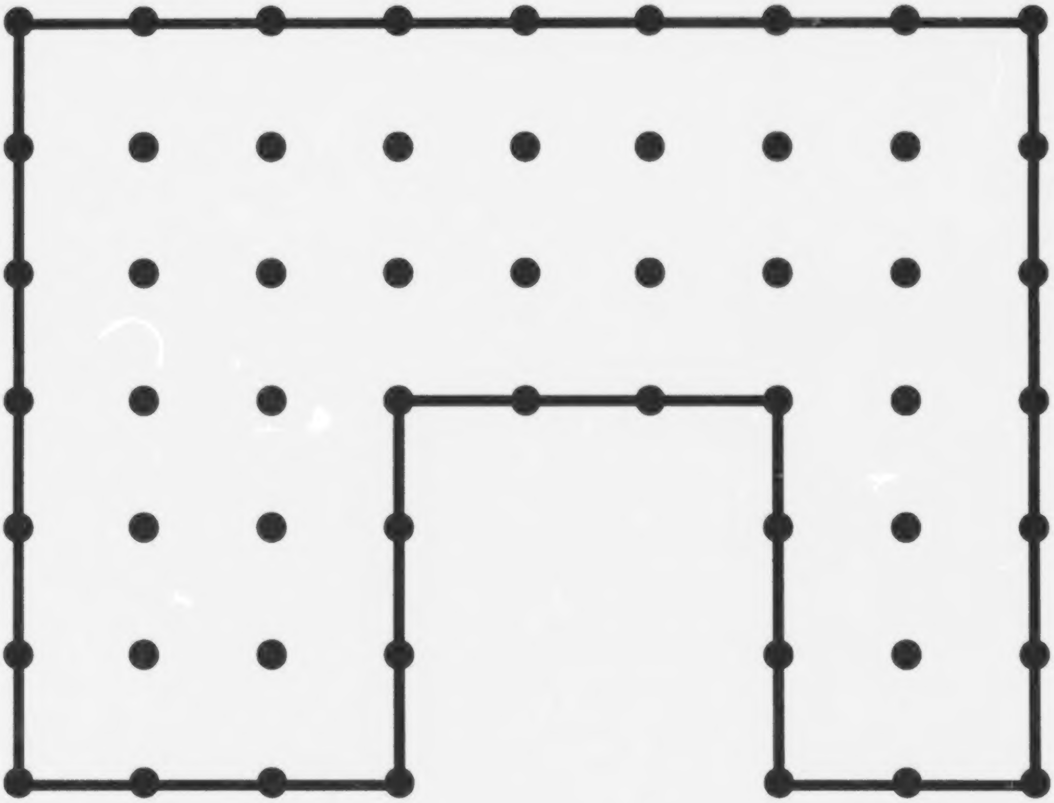
  Teacher observation

- **HOME ACTIVITY:**

  Students measure (in feet) and make a drawing of a room at home which has a closet. They then find the area of the room with the closet, labeling the area on their drawing. This information can be useful for ordering carpeting or linoleum flooring.

Transparency 1

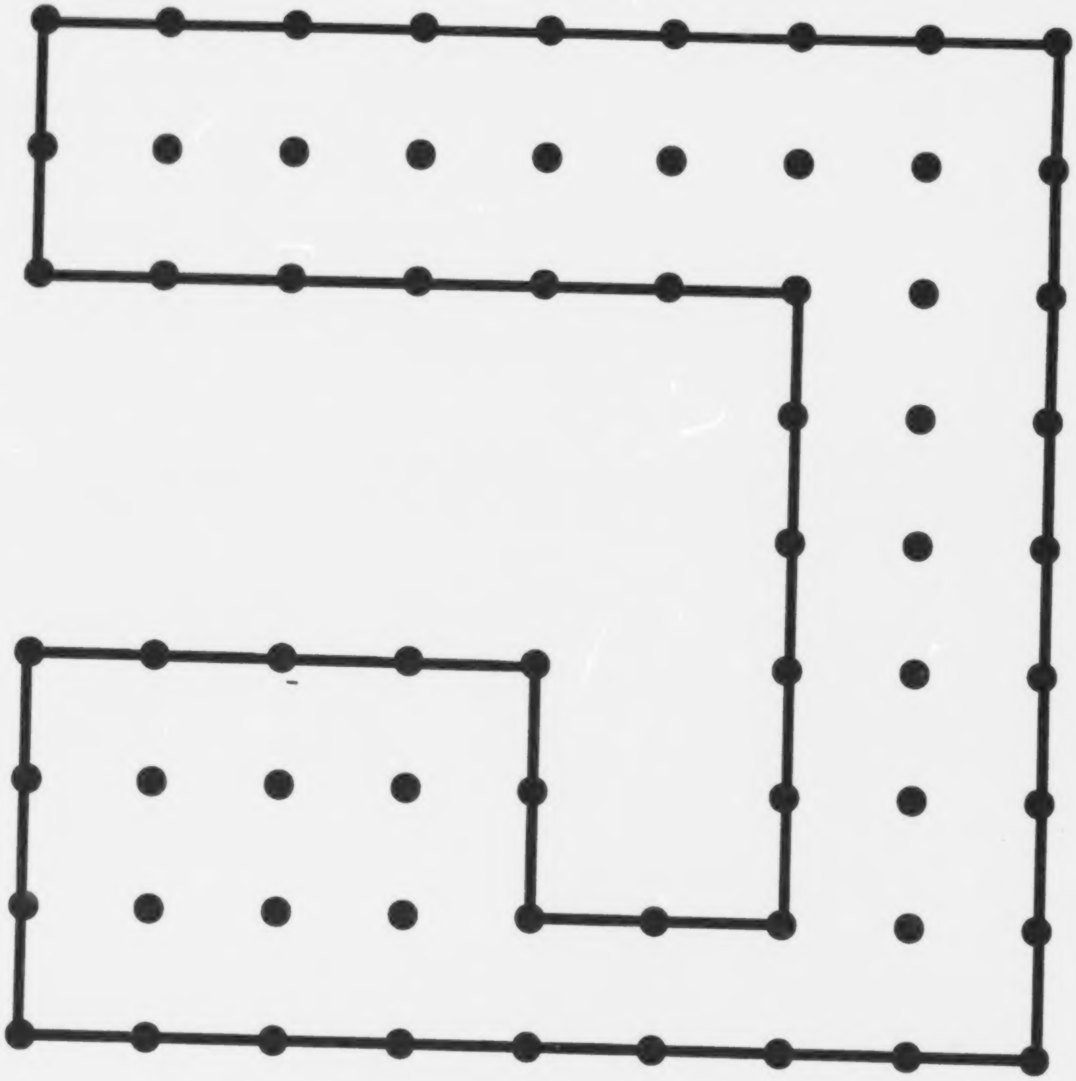
PUSH "M" FOR AREA



Transparency 2

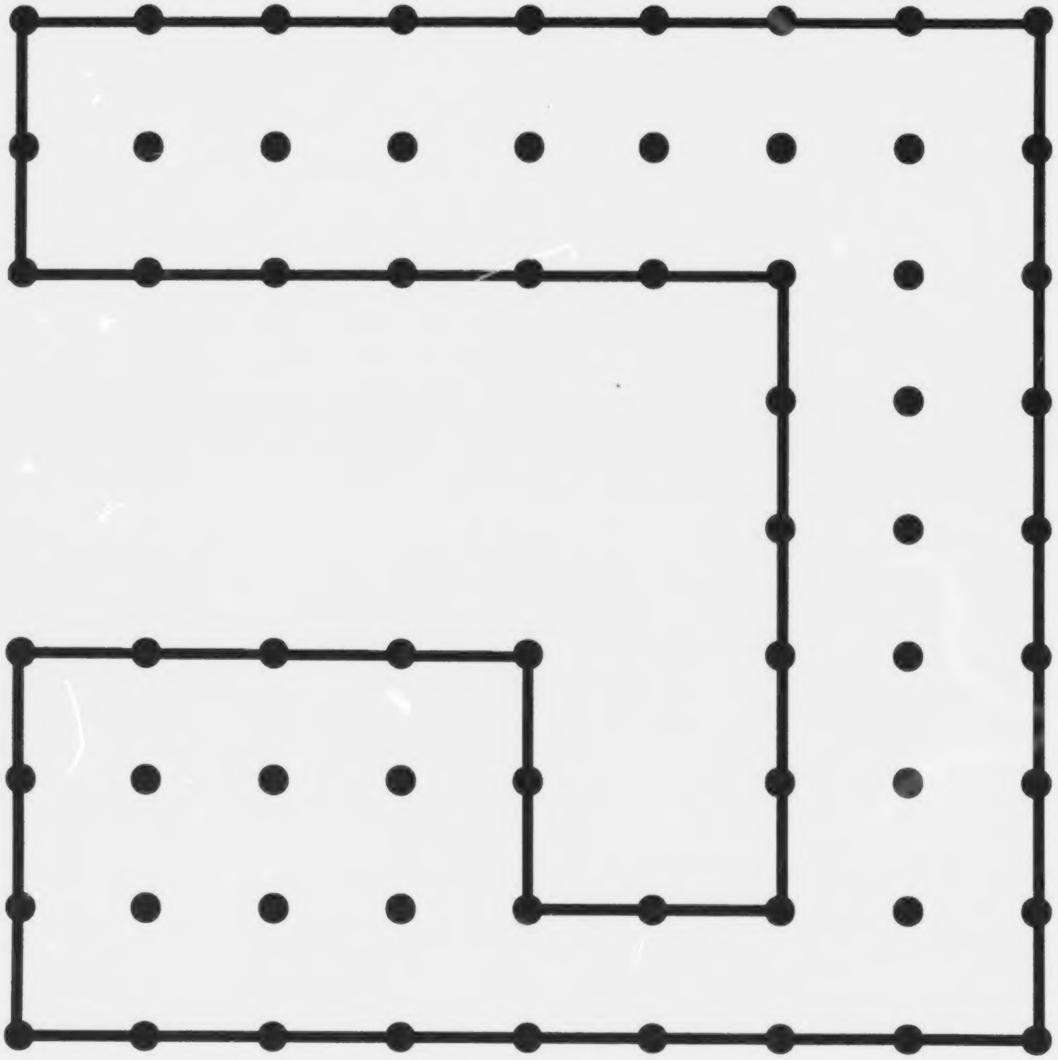
PUSH "M" FOR AREA

Student Activity Sheet 1



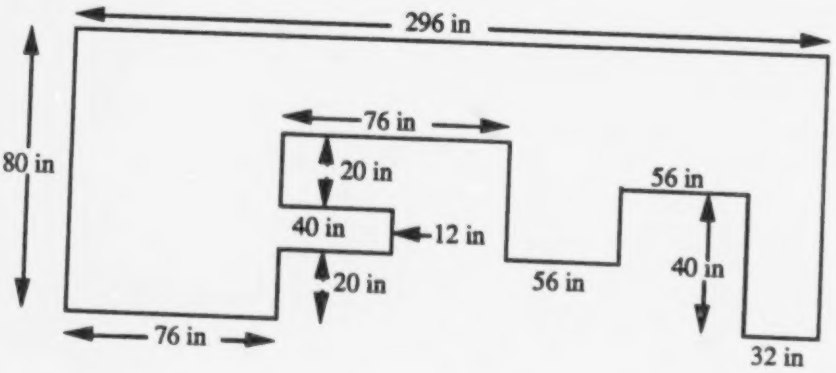
60

PUSH "M" FOR AREA
Student Activity Sheet 1



PUSH "M" FOR AREA
Student Activity Sheet 2

Directions: The diagram below is of a special kitchen counter. It is to be made of marble which is expensive. The builder needs to know the exact area of the counter. Compute the area for the counter.


296 in
80 in
76 in
20 in
56 in
40 in
12 in
20 in
56 in
40 in
76 in
32 in

[M+]	Adds data into the memory
[M-]	Subtracts from the memory's total
[MR]/[MRC]	Recalls the current figure from the memory

THE PENCIL BOX PROBLEM

GRADE:	3 - 4
STRAND:	Patterns and Functions
SKILL:	Find a function rule from a situation or graph
MANAGEMENT **CLASS ORGANIZATION:**	Whole class, pairs
TIME FRAME:	One class period
MATERIALS:	Calculator, transparency of Student Activity Sheet 1
VOCABULARY:	Function rule, ordered pairs
PREREQUISITE SKILL:	Mathematics: Coordinate graphing Calculator: Memory keys

LESSON The purpose of this lesson is to use a graph to estimate quantities and to record ordered pairs.

- **DIRECTED INSTRUCTION:**

Five hundred prizes are needed for a Mathematics Field Day. The local toy store has a special sale on pencil boxes. Each box has four pencils and three erasers. How many boxes will need to be purchased?

Project the transparency. Explain that a graph is used to record information. Have students read the labels on the graph and identify the ordered pairs for the three points on the line.

(60, 420) (80, 560) (100, 700)

What is the rule? [**answer:** multiply by 7]
The line on the graph shows the function rule.
Use the line to find the number of items in 70 boxes. Demonstrate how to go over to 70 and up to the intersection with the line. Show that the intersection is between 480 and 500. Apply the rule:

$$7 \times 70 = 490$$

Use the line to find the number of items in 87 boxes. Estimate using the line, and then use the calculator to get the actual number [**answer:** 7 x 87 = 609].

- **GUIDED PRACTICE:**

Distribute Student Activity Sheets 1 and 2 to pairs of students. They will use the graph to make an estimate, use the calculator to verify the number of items, and then record the ordered pairs.

Work through the first two examples.
Example 1:
60 boxes. Estimate from the line on the graph: 420
Number of items using the rule: 420
Ordered pair [**answer:** (60,420)]
Example 2:
65 boxes. Estimate from the line on the graph: 450
Number of items using the rule: 455
Ordered pair [**answer:** (65,455)]

Students complete Student Activity Sheet 2.

- **INDEPENDENT PRACTICE:**

  Distribute Student Activity Sheet 3. Students work together to plot the points for the given ordered pairs and draw the line. Use the line to determine the missing numbers in the remaining ordered pairs. Complete the chart by recording the numbers of boxes and items.

- **EVALUATION:**

  Teacher observation.

- **HOME ACTIVITY:**

  Students demonstrate understanding of the function rule by completing the home activity sheet.

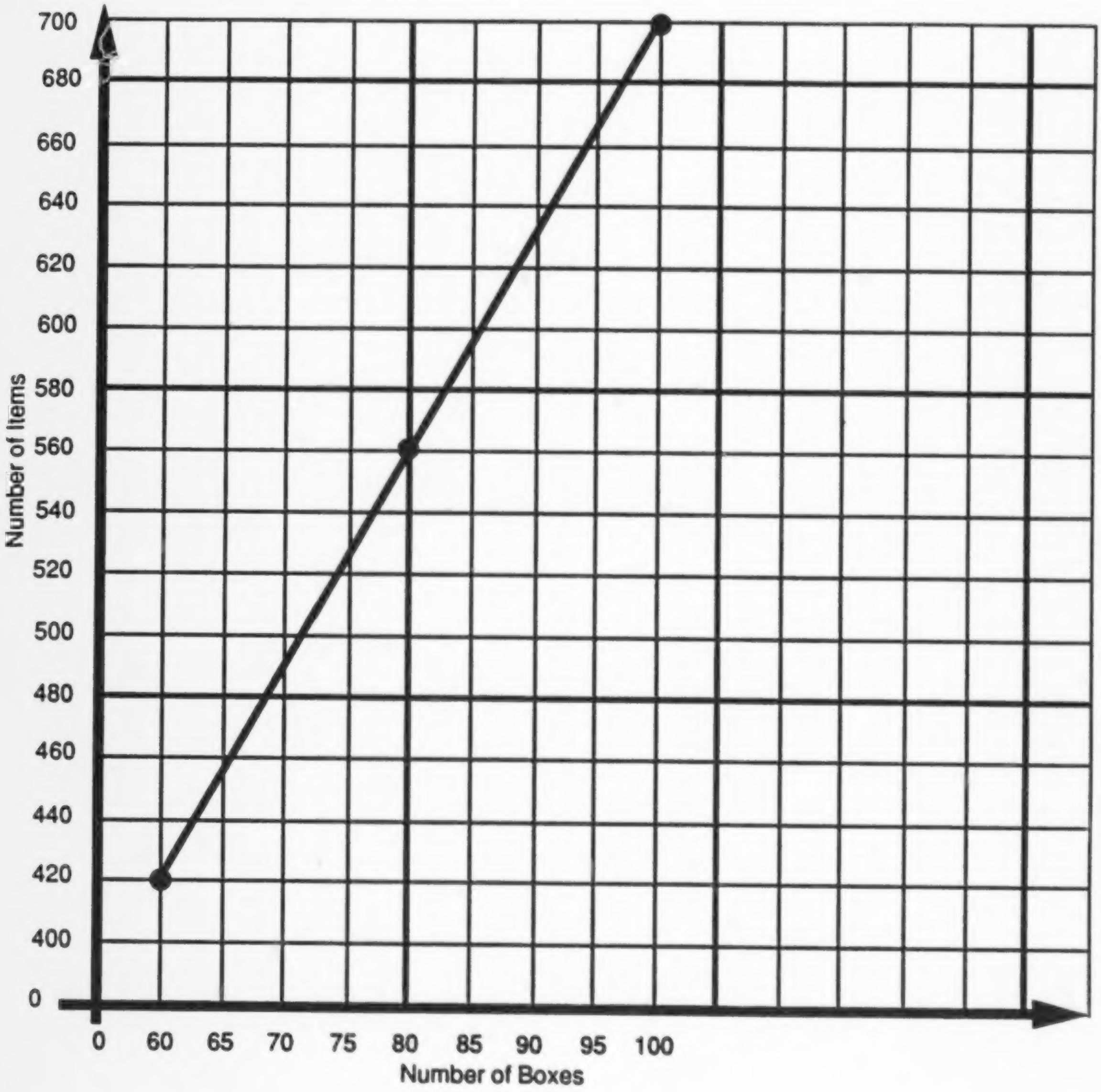
Answers:

# of People	# of 6 packs
20	4
48	8
5	1
60	10
42	7
54	9

THE PENCIL BOX PROBLEM

Student Activity Sheet 1

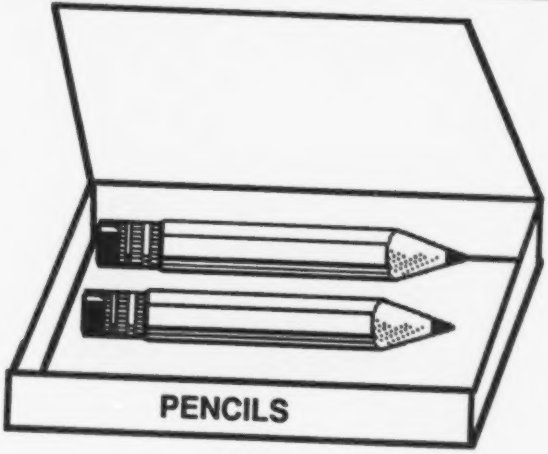
Put the ordered pairs on the graph.



THE PENCIL BOX PROBLEM

Student Activity Sheet 2

Number of Boxes	Estimate	Number of Items	Ordered Pairs
60			
65			
70			
73			
75			
80			
85			
87			
90			
93			
95			
97			
99			
100			

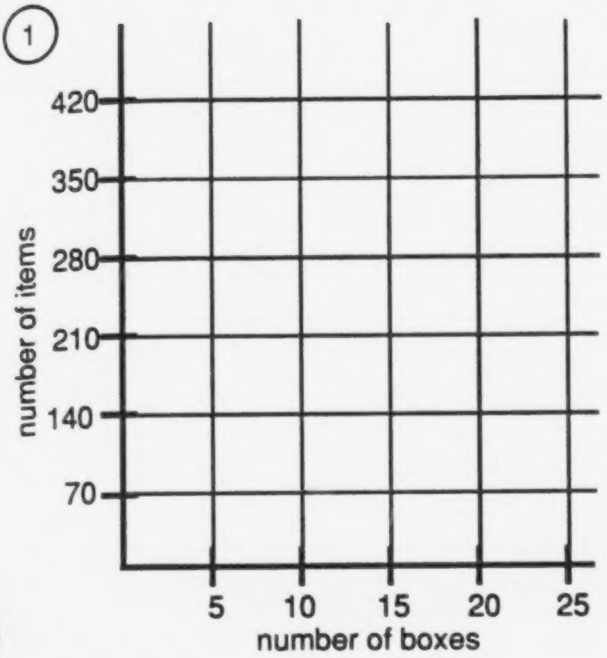


THE PENCIL BOX PROBLEM

Student Activity Sheet 3

Directions: Complete the table, plot the points, draw the lines and state the rule.

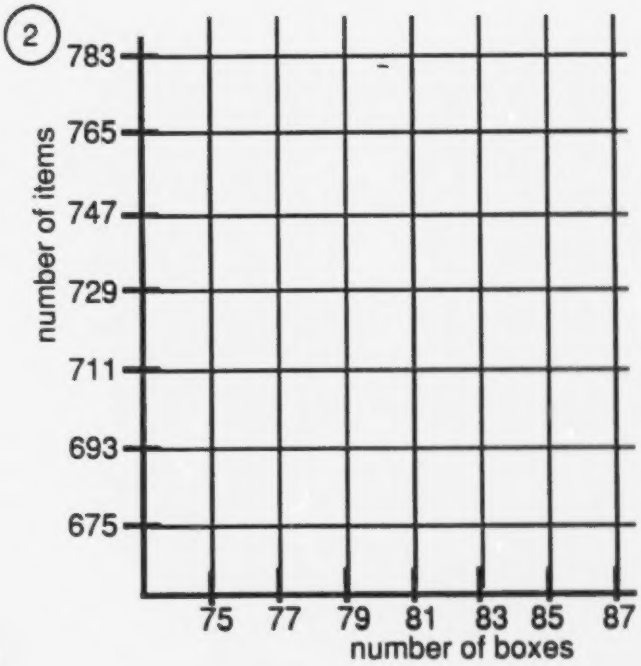
①



Boxes	Items	Ordered Pairs
5	70	(5, 70)
		(7,)
		(12,)
		(15, 210)
		(17,)
		(20,280)
		(25,)

Rule ________________________

②



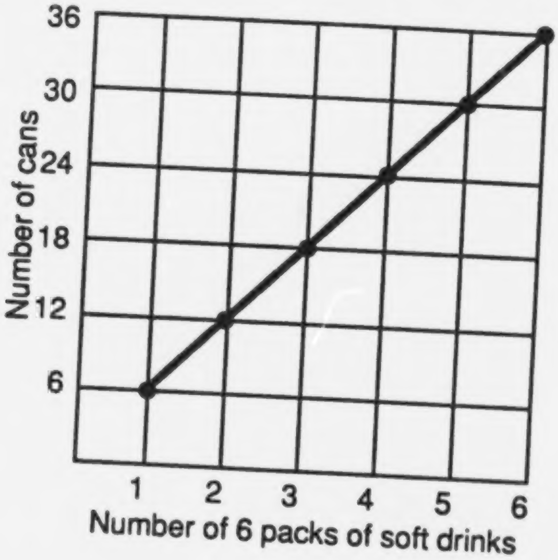
Boxes	Items	Ordered Pairs
		(75, 675)
		(76,)
		(77,)
		(78,)
		(79, 711)
		(80,)
		(81, 729)
		(82,)
		(83,)
		(84,)
		(85, 765)
		(87,)

Rule ________________________

THE PENCIL BOX PROBLEM

Home Activity Sheet

Use the graph to determine how many soft drinks to buy for the given numbers of people. Assume that every person will have one soft drink.

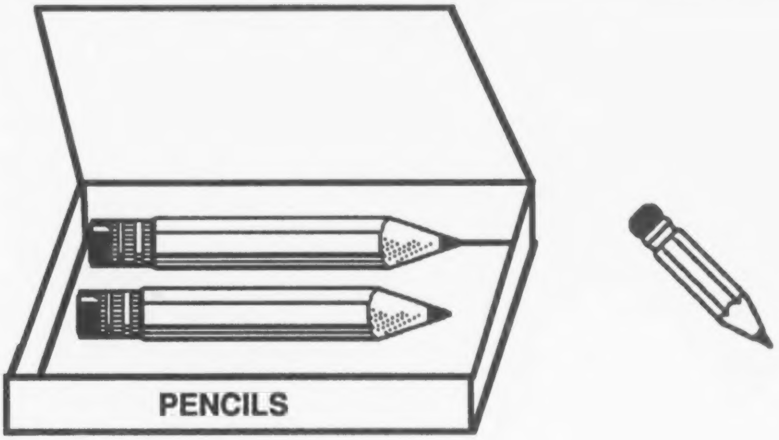


Soft drinks for	How many 6 packs would you need to buy?
20 people	____________
48 people	____________
5 people	____________
60 people	____________
42 people	____________
54 people	____________

THE PENCIL BOX PROBLEM

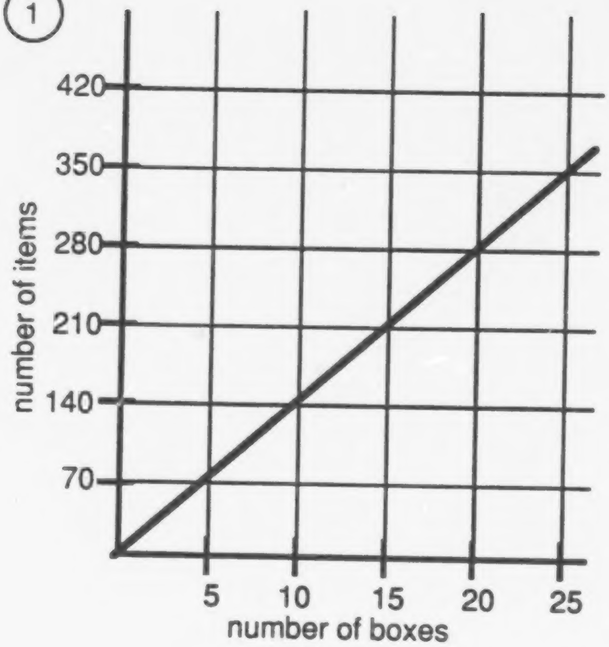
Teacher Answer Sheet 2

Boxes	Estimate	Number of Items	Ordered Pairs
60		420	(60, 420)
65		455	(65, 455)
70		490	(70, 490)
73		511	(73, 511)
75		525	(75, 525)
80		560	(80, 560)
85		595	(85, 595)
87		609	(87, 609)
90		630	(90, 630)
93		651	(93, 651)
95		665	(95, 665)
97		679	(97, 679)
99		693	(99, 693)
100		700	(100, 700)



THE PENCIL BOX PROBLEM
Teacher Answer Sheet 3

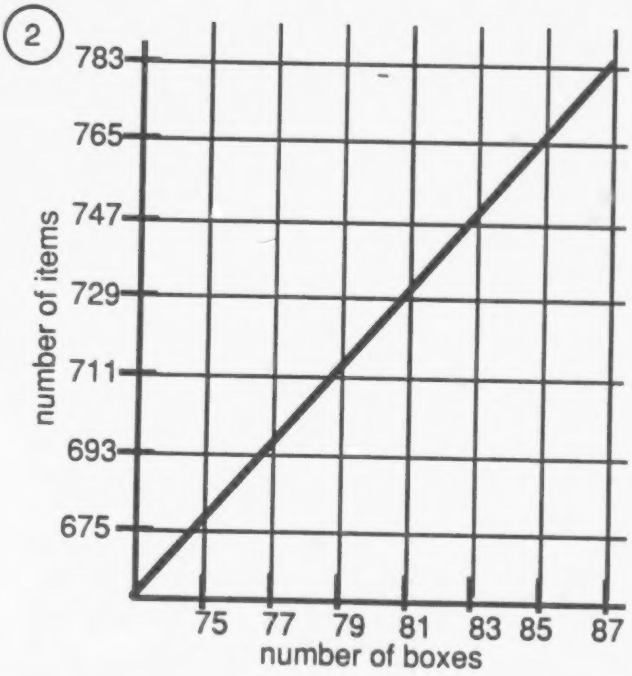
①



Boxes	Items	Ordered Pairs
5	70	(5, 70)
7	98	(7, 98)
12	168	(12, 168)
15	210	(15, 210)
17	238	(17, 238)
20	280	(20,280)
25	350	(25, 350)

Rule Multiply by 14

②



Boxes	Items	Ordered Pairs
75	675	(75, 675)
76	684	(76, 684)
77	693	(77, 693)
78	702	(78, 702)
79	711	(79, 711)
80	720	(80, 720)
81	729	(81, 729)
82	738	(82, 738)
83	747	(83, 747)
84	756	(84, 756)
85	765	(85, 765)
86	774	(86, 774)

Rule Multiply by 9

BIG "D'S" PARKING GARAGE I

GRADE:	3 - 4
STRAND:	Logic
SKILL:	Use charts to organize information to solve simple logic problems
MANAGEMENT **CLASS ORGANIZATION:**	Whole class and small groups
TIME FRAME:	One class period
MATERIALS:	Calculator, Transparency 1, Transparency of Student Activity Sheet 1
VOCABULARY:	Logical reasoning
PREREQUISITE SKILL:	Mathematics: Basic operations, logic grid Calculator: Basic functions

LESSON The purpose of this lesson is to use logical reasoning to solve a problem.

- **DIRECTED INSTRUCTION:**

  Discuss methods to solve a logical reasoning problem. Project Transparency 1 and use the following sequence to demonstrate the use of the logic grid.

1. Read the problem and all of the clues. Clues can be tricky. One clue may give a little information by itself but a lot more information when you fit it together with another clue.
   What is the problem? [**answer**: Who lives in each different colored house.]
   Who are the people in the problem? [**answer**: Bob, Terri, Dave]
   What are the colors of the houses?[**answer**: Green, Yellow, Brown]

2. Demonstrate how to label the grid with the names of the people across the top and the colors down the side.

3. Demonstrate how to mark the grid after reading a clue.

Clue #1 - Dave does not live in the green house.

	Bob	Terri	Dave
Green			no
Yellow			
Brown			

Clue #2 - Terri does not live in the yellow house.

	Bob	Terri	Dave
Green			no
Yellow		no	
Brown			

Clue #3 - Bob's house is not green or brown.

	Bob	Terri	Dave
Green	no		no
Yellow		no	
Brown	no		

Conclusion - Bob lives in the yellow house because he doesn't live in the green or brown house.

	Bob	Terri	Dave
Green	no		no
Yellow	yes	no	
Brown	no		

Conclusion - Dave does not live in the yellow house because Bob lives there.

	Bob	Terri	Dave
Green	no		no
Yellow	yes	no	no
Brown	no		

Conclusion - Terri lives in the green house because neither Bob nor David live there.

	Bob	Terri	Dave
Green	no	yes	no
Yellow	yes	no	no
Brown	no		

Conclusion- Terri does not live in the brown house because she lives in the green house. Dave lives in the brown house because he doesn't live in the yellow or green house.

	Bob	Terri	Dave
Green	no	yes	no
Yellow	yes	no	no
Brown	no	no	yes

CAMP-LA

- **GUIDED PRACTICE:**

  Distribute Student Activity Sheet 1. Project Transparency of Student Activity Sheet 1 and guide students through the process of completing the logic grid.
  Discuss the solution to the problem:

  Conclusion from Clue #1 - Rosie is not Red or Skipper
  Conclusion from Clue #2 - Skipper is female
  Conclusion from Clue #3 - Red is not Jose and Jose is not Bud

	Bud	Skipper	Tug	Red
Rosie	yes	no	no	no
Damon	no	no	no	yes
Jose	no	no	yes	no
Wendy	no	yes	no	no

- **INDEPENDENT PRACTICE:**

  Read Student Activity Sheet 2A together. Distribute Student Activity Sheets 2B and 2C.
  Students work with a partner to solve the problem.

- **EVALUATION:**

  Students explain how they arrived at their solution.

- **HOME ACTIVITY:**

  Solve this riddle with your family: What can you put in a bucket to make it weigh less?

Transparency 1

BIG "D'S" PARKING GARAGE I

Example 1

Bob, Terri, and Dave each live in a different house colored green, yellow, or brown.

Dave does not live in the green house. Terri does not live in the yellow house. Bob's house is not green or brown.

What is the color of each person's house?

BIG "D'S" PARKING GARAGE I

Student Activity Sheet 1

Example 2

Rosie, Damon, Jose, and Wendy each have nicknames. The nicknames are Bud, Skipper, Tug and Red not necessarily in that order. Read the clues to find the nickname of each person.

Clues:

Rosie is shorter than Red and is taller than Skipper.

Skipper bought her mother a present yesterday.

Red is older than Jose and younger than Bud.

NICKNAMES

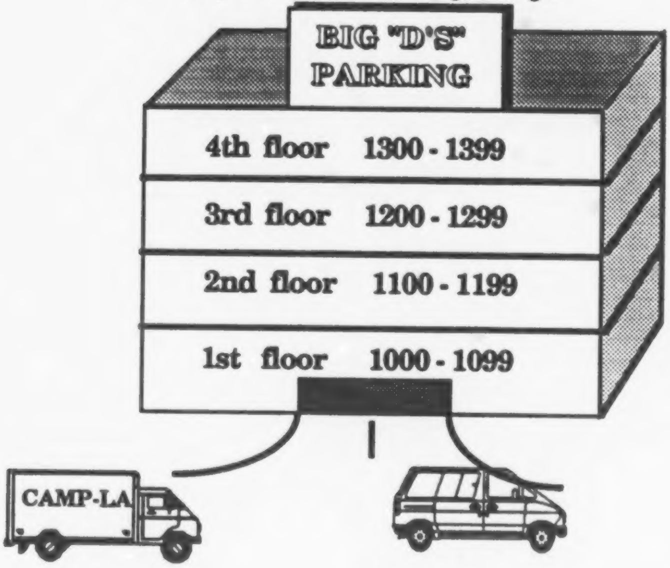
	Bud	Skipper	Tug	Red
Rosie				
Damon				
Jose				
Wendy				

BIG "D'S" PARKING GARAGE I

Student Activity Sheet 2A

Read the story. Read all of the clues. Which clue gives enough information to decide where one of the cars is parked?

The Story of Big "D's" Parking Garage

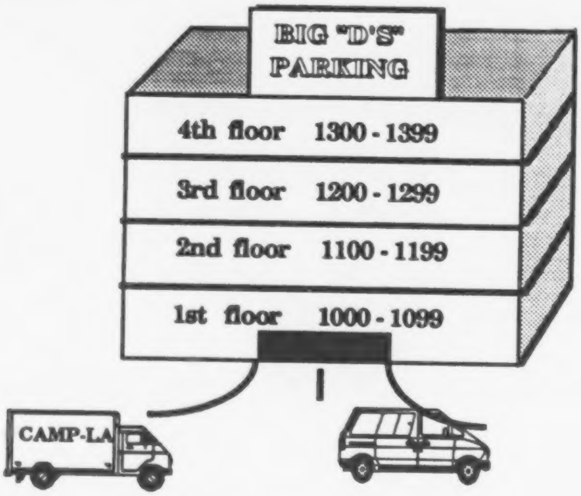

BIG "D'S" PARKING
4th floor 1300 - 1399
3rd floor 1200 - 1299
2nd floor 1100 - 1199
1st floor 1000 - 1099
CAMP-LA

This is Big "D's" Parking Garage. Drivers have assigned parking spaces. Each parking space is numbered. The illustration shows how the spaces are numbered.

One day 4 drivers forgot their parking space numbers. They thought that if they could just find the correct floor then they would remember their parking space numbers. Big "D", the owner of the parking garage, likes logic puzzles and math games. Big "D" said he would help the drivers find their parking spaces by giving them 3 clues. If the drivers could determine the floor they park on, Big "D" would tell them their parking space number. Help the drivers solve their problem.

BIG "D'S" PARKING GARAGE I

Student Activity Sheet 2B

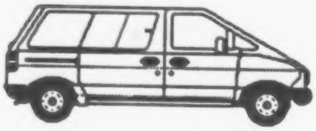

BIG "D'S"
PARKING
4th floor 1300 - 1399
3rd floor 1200 - 1299
2nd floor 1100 - 1199
1st floor 1000 - 1099
CAMP-LA

1. Problem: On which floor is each car parked?

Use the following information, clues, the logic chart, and a calculator to solve the problem:

Clues and Information

Car models and the year each was built:



BMW	BUICK	CHEVY	HONDA
1984	1987	1979	1978

CLUES:

Each car parks on a different floor. The car that parks on the fourth floor was built in a year that is 590 more than its parking space number.

If the Buick parks in the correct space, then the year it was built is close to 800 more than its parking space number.

The car that parks on the third floor was built in a year that is 756 more than its parking space number. It is six years older than the car on the 1st floor.

BIG "D'S" PARKING GARAGE I

Student Activity Sheet 2C

LOGIC CHART

FLOORS

	1st	2nd	3rd	4th
BMW				
Buick				
Chevy				
Honda				

2. Problem: Find the parking space number for each car. Use the clues from the first problem and the 2 clues listed below to solve the problem.

Clues:

If you find the average date of manufacture of the four cars, it will be 900 greater than the first-floor parking space.

If you round the year the Buick was manufactured to the nearest decade, then its space number is exactly 200 greater than half its date.

The BMW's parking space is number ______ on the ______ floor.
The Buick's parking space is number ______ on the ______ floor.
The Chevy's parking space is number ______ on the ______ floor.
The Honda's parking space is number ______ on the ______ floor.

BIG "D'S" PARKING GARAGE I

Teacher Answer Sheet

LOGIC CHART

FLOORS

	1st	2nd	3rd	4th
BMW	No	No	Yes	No
Buick	No	Yes	No	No
Chevy	No	No	No	Yes
Honda	Yes	No	No	No

2. Problem: Find the parking space number for each car. Use the clues from the first problem and the 2 clues listed below to solve the problem.

Clues:

If you find the average date of manufacture of the four cars, it will be 900 greater than the first-floor parking space.

If you round the year the Buick was manufactured to the nearest decade, then its space number is exactly 200 greater than half its date.

The BMW's parking space is number 1228 on the 3rd floor.

The Buick's parking space is number 1195 on the 2nd floor.

The Chevy's parking space is number 1389 on the 4th floor.

The Honda's parking space is number 1082 on the 1st floor.

WATCH YOUR MONEY GROW

GRADE: 5 - 6

STRAND: Number

SKILL: Use powers and multiples of powers to explore large numbers.

MANAGEMENT

CLASS ORGANIZATION: Pairs

TIME FRAME: One or two math periods

MATERIALS: Calculator

VOCABULARY: Millions, thousands

PREREQUISITE SKILL: Place value

LESSON

- **DIRECTED INSTRUCTION:**

Tell students the purpose of this lesson is to discover how rapidly numbers grow through multiplication. Give students Student Activity Sheet 1. Read the situation with your class. Everyone records an estimate and completes the worksheet.

Note: The constant function of the calculator may be used in this activity. For example, on Student Activity Sheet 1 you may press 2 x 1===...

Discuss students' results and comments.

- **INDEPENDENT PRACTICE:**

Hand out Student Activity Sheet 2. Working in pairs, students complete the worksheet. Discuss results with the class.

Hand out Student Activity Sheet 3. Working in pairs, students complete the worksheet. Discuss results with the class.

Hand out Home Activity. Encourage Students to do the activity with their parents.

- **EVALUATION:**

Teacher observation and Student Activity Sheets.

WATCH YOUR MONEY GROW
Student Activity Sheet 1
Teacher Answer Sheet

Somebody gives you a magic dollar. It is magic because every night it doubles so that the next day instead of one dollar you have two magic dollars.

Estimate how many days it will take for your dollar to become over a million dollars.

Record your estimate: ____________________

Complete the chart below using your calculator.
(Note: on the calculator you are continually multiplying the number shown on the display by 2 without clearing the calculator.)

Day number	Number of magic dollars
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128
9	256
10	512
11	1024
12	2048
13	4096
14	8192
15	16384
16	32768
17	65536
18	131072
19	262144
20	524288
21	1048576
22	
23	
24	

At what point were you surprised by the number of magic dollars?

____

____

How did the result differ from your expectations?

____

WATCH YOUR MONEY GROW
Student Activity Sheet 2
Teacher Answer Sheet

Somebody gives you a magic nickel. Each magic nickel grows overnight to three magic nickels. Estimate how many days it would take until your magic nickel becomes at least one million dollars.

Record your estimate: ______________________

Complete the chart below using your calculator. (Note: You continually multiply the number shown on the display by 3 without clearing the calculator or use your calculators constant function.)

Day number	Number of magic dollars
1	.05
2	.15
3	.45
4	1.35
5	4.05
6	12.15
7	36.45
8	109.35
9	328.05
10	984.15
11	2952.45
12	8857.35
13	26572.05
14	79716.15
15	239148.45
16	717445.35
17	2152336.05
18	
19	
20	

How did the result differ from your expectations?

Answer will vary.

Compare these results to those you found in Student Activity Sheet 1.

WATCH YOUR MONEY GROW

Student Activity Sheet 3
Teacher Answer Sheet

Magic quarters double every night to 2 magic quarters. Magic pennies change every night to 4 magic pennies.

If you could borrow one of these coins for only 5 days, which coin would you choose?

Magic Quarter

If you could borrow one of these coins for 13 days, which would you choose?

Magic Penny

Now complete the chart. Use it to decide if you made the correct choices. Complete one column before starting the other.

Day number	Magic Quarter (multiply by 2)	Magic Penny (multiply by 4)
1	.25	.01
2	.50	.04
3	1	.16
4	2	.64
5	4	2.56
6	8	10.24
7	16	40.96
8	32	163.84
9	64	655.36
10	128	2621.44
11	256	10485.76
12	512	41943.04
13	1024	167772.16

What did you discover? Why do you think this happened?

WATCH YOUR MONEY GROW
Teacher Answer Sheet

HOME ACTIVITY:

Discuss the following problem at home. If you were to sign a contract with your family that in return for keeping your room clean for an entire year you would to be given 1 penny the first day of February, two pennies the second day of February, 4 pennies the next, doubling each day until the month was over, would this be a fair deal? Would your family be willing to pay you that much?

Why or why not?

Using the calendar for February, fill in the amount of money that you would be paid each day.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 $.01	2 $.02	3 $.04	4 $.08	5 $.16	6 $.32
7 $.64	8 $1.28	9 $2.56	10 $5.12	11 $10.24	12 $20.48	13 $40.96
14 $81.92	15 $163.84	16 $327.68	17 $655.36	18 $1310.72	19 $2621.44	20 $5242.88
21 $10485.76	22 $20971.52	23 $41943.04	24 $83886.08	25 $167772.16	26 $335544.32	27 $671088.64
28 $1342177.28	(calculator shows 1342177.2)					

What did you discover?

How did the results differ from your family's expectation?

Share your discoveries from Student Activity Sheets 1, 2, and 3 with your family.

Name ______________

WATCH YOUR MONEY GROW

Student Activity Sheet 1

Somebody gives you a magic dollar. It is magic because every night it doubles so that the next day instead of one dollar you have two magic dollars.

Estimate how many days it will take for your dollar to become over a million dollars.

Record your estimate: ______________

Complete the chart below using your calculator.
(Note: on the calculator you are continually multiplying the number shown on the display by 2 without clearing the calculator.)

Day number	Number of magic dollars
1	1
2	2
3	4
4	8
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	

At what point were you surprised by the number of magic dollars?

____

____

How did the result differ from your expectations?

____

____

85

Name ____________________

WATCH YOUR MONEY GROW

Student Activity Sheet 2

Somebody gives you a magic nickel. Each magic nickel grows overnight to three magic nickels. Estimate how many days it would take until your magic nickel becomes at least one million dollars.

Record your estimate: ____________________

Complete the chart below using your calculator.(Note: You continually multiply the number shown on the display by 3 without clearing the calculator or use your calculators constant function.)

Day number	Number of magic dollars
1	.05
2	.15
3	.45
4	1.35
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

How did the result differ from your expectations?

Compare these results to those you found in Student Activity Sheet 1.

Name ____________________

WATCH YOUR MONEY GROW
Student Activity Sheet 3

Magic quarters double every night to 2 magic quarters. Magic pennies change every night to 4 magic pennies.

If you could borrow one of these coins for only 5 days, which coin would you choose?

____

If you could borrow one of these coins for 13 days, which would you choose?

____

Now complete the chart. Use it to decide if you made the correct choices.
Complete one column before starting the other.

Day number	Magic Quarter (multiply by 2)	Magic Penny (multiply by 4)
1	.25	.01
2	.50	.04
3		.16
4		.64
5		
6		
7		
8		
9		
10		
11		
12		
13		

What did you discover? Why do you think this happened?

____

____

____

Name____________________

WATCH YOUR MONEY GROW

Home Activity Sheet

Discuss the following problem at home. If you were to sign a contract with your family that in return for keeping your room clean for an entire year you would to be given 1 penny the first day of February, two pennies the second day of February, 4 pennies the next, doubling each day until the month was over, would this be a fair deal? Would your family be willing to pay you that much?____

Why or why not?____

____

Using the calendar for February, fill in the amount of money that you would be paid each day.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 \$.01	2 \$.02	3 \$.04	4 \$.08	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	(This is a non-Leap year February)					

What did you discover?

____

____

How did the results differ from your family's expectations?

____

____

Share your discoveries from Student Activity Sheets 1, 2, and 3 with your family.

FOLDING PAPER

GRADE: 5 - 6

STRAND: Geometry/ Patterns and Functions

SKILL: Find perimeter of rectangles, and area of rectangular regions. Identify, extend, and create number patterns.

MANAGEMENT

CLASS ORGANIZATION: Whole class, small group

TIME FRAME: One math period

MATERIALS: Calculator, 8.5 by 11" paper, rulers

VOCABULARY: Perimeter, area, rectangle, rectangular region

PREREQUISITE SKILL: Perimeter and area of rectangles

LESSON

- **DIRECTED INSTRUCTION and GUIDED PRACTICE:**

1. Give students a piece of paper (8.5 by 11) inches and the Student Record Sheet. Find the perimeter of the rectangle represented by the paper. [P = 39 in.] Find the area of the rectangular region of the paper. [A = 93.5 sq. in.]

2. Fold the piece of paper in half matching the 8.5 inch edges together. What are the dimensions of the new rectangle? [8.5 by 5.5] Find the perimeter of the new rectangle. [P = 28 in.] Find the area of the rectangular region. [A= 46.75 sq. in.]

3. Fold the paper in half again, matching the 5.5 inch edges together. Find the:

Length	[5.5 in.]
Width	[4.25 in.]
Perimeter	[P= 19.5 in.]
Area	[A= 23.375 sq. in.]

- **INDEPENDENT PRACTICE:**

1. Repeat the activity by folding the paper in half, always matching the shorter sides. Continue until you complete the chart. Look for patterns.

EVALUATION:

1. How did the length and width of the rectangle change after you folded the paper? [The width of the new rectangle is .5 (the length of the previous rectangle), and the length of the new rectangle was the width of the previous rectangle.]

2. How did the perimeter of the rectangle change? [The perimeter of the third rectangle was .5 of the perimeter (the first rectangle). The perimeter of the fourth rectangle was .5 (the perimeter of the second rectangle), and so on.]

3. How did the area of the new rectangular region change? [The area of the new rectangular region was .5 (the area of the previous rectangular region).]

HOME ACTIVITY:

Each student measures his or her room to find :

1. The perimeter and area of the floor.

2. The perimeter and area of one wall.

FOLDING PAPER

Student Record Sheet
Teacher Answer Sheet

	Length	Width	Perimeter	Area (calculator display)
Original paper	11 in.	8.5 in.	39 in.	93.5 sq. in.
First Fold	8.5 in.	5.5 in.	28 in.	46.75 sq. in.
Second Fold	5.5 in.	4.25 in.	19.5 in.	23.375 sq. in.
Third Fold	4.25 in.	2.75 in.	14 in.	11.6875 sq. in.
Fourth Fold	2.75 in.	2.125 in.	9.75 in.	5.84375 sq. in.
Fifth Fold	2.125 in.	1.375 in.	7 in.	2.921875 sq. in.
Sixth Fold	1.375 in.	1.0625 in.	4.875 in.	1.4609375 sq. in.
Seventh Fold	1.0625 in.	0.68755 in.	3.5 in.	0.73046875 sq. in. (0.7304687)
Eighth Fold	0.6875 in.	0.53125 in.	2.4375 in.	0.365234375 sq. in. (0.3652343)
Ninth Fold	0.53125 in.	0.34375 in.	1.75 in.	0.1826171875 sq. in. (0.1826171)
Tenth Fold	0.34375 in.	0.265625 in.	1.21875 in.	0.09130859375 sq. in. (0.0913085)

Write any patterns you found and conclusions you reached from the data above.

Name ____________________

FOLDING PAPER
Student Record Sheet

	Length	Width	Perimeter	Area (calculator display)
Original paper	11 in.	8.5 in.	39 in.	93.5 sq. in.
First Fold	8.5 in.	5.5 in.		
Second Fold				
Third Fold				
Fourth Fold				
Fifth Fold				
Sixth Fold				
Seventh Fold				
Eighth Fold				
Ninth Fold				
Tenth Fold				

Write any patterns you found and conclusions you reached from the data above.

____

____

____

____

Number of Adult tickets	Total Cost of Adult tickets	Number of Student Tickets	Total Cost of Student Tickets	Total Cost of All tickets
→5X→		→3X→		
3	$15	95	$285	$300
6	$30	90	$270	$300
9	$45	85	$255	$300
12	$60	80	$240	$300
15	$75	75	$225	$300
18	$90	70	$210	$300
21	$105	65	$195	$300
24	$120	60	$180	$300
27	$135	55	$165	$300
30	$150	50	$150	$300
33	$165	45	$135	$300
36	$180	40	$120	$300
39	$195	35	$105	$300
42	$210	30	$90	$300
45	$225	25	$75	$300
48	$240	20	$60	$300
51	$255	15	$45	$300
54	$270	10	$30	$300
57	$285	5	$15	$300

Ask students what patterns they observe in the chart. They should notice that in this form the first column increases by 3, the second by 15, the third decreases by 5, the fourth decreases by 15. They might say, as the student numbers get larger, the adult numbers get smaller. Give credit to any true observations.

- **INDEPENDENT PRACTICE:**

  Have students or groups of students complete Student Activity Sheet 2. Discuss the results with the class.

- **EVALUATION:**

  Have students or groups of students develop a similar situation. Write a chart recording all possible solutions, then write a set of conditions which narrows the choices down to a single solution.

GOING TO THE MOVIES

GRADE: 5 - 6

STRAND: Logic

SKILL: Organize and interpret data.

MANAGEMENT

CLASS ORGANIZATION: Small group or pairs

TIME FRAME: One math period

MATERIALS: Calculator, overhead transparency

PREREQUISITE SKILL: Interpret data from a table

LESSON

- **DIRECTED INSTRUCTION:**

Tell the class this story. **Some students from our school would like to take a field trip to the movies. Adults as well as children must attend. Adult tickets cost $5 and student tickets $3. Your job is to investigate what possible combinations of students and adults can attend if you must spend EXACTLY $300.** Use an overhead transparency of Student Activity Sheet 1.

Ask, can these conditions be met if only 1 adult attends? Give them time to figure out that 1 adult ticket costing $5 would leave $295 for student tickets.

The answer to 295 ÷ 3 is not a whole number, so you can't spend exactly $295 on $3 student tickets.

There must be more than 1 adult. Ask, can there be exactly 2 adults? Give them time to work. Discuss that 2 adult tickets at $5 each leaves $290 for student tickets. 290 ÷ 3 is not a whole number so you can't spend exactly $290 on student tickets. There can't be 2 adults.
Ask, can there be exactly 3 adults? Allow time for students to work, then discuss that 3 adult tickets cost $15. There is $285 left for student tickets. 285 ÷ 3 = 95, so 95 student tickets could be purchased. Hand out the Student Activity Sheet 1. Tell them that the chart has already been filled in for 3 adults on the trip.

- **GUIDED PRACTICE:**

Ask students to see if there can be exactly 4, 5, 6 or more adults. Have them fill in successful solutions on their chart.
Ask students to find as many solutions as possible. Suggest that they look at the successful solutions on their chart to see if they can detect any patterns that will assist them in finding additional solutions. After they have spent sufficient time finding solutions, hand out Student Activity Sheet 2.

GOING TO THE MOVIES
Student Activity Sheet 2
Teacher Answer Key

(Hand out only after Student Activity Sheet 1 has been completed and discussed)

	Number of Adult tickets	Total Cost of Adult tickets	Number of Student Tickets	Total Cost of Student Tickets	Total Cost of All tickets
	→5X→		→3X→		
Z	3	$15	95	$285	$300
Z	6	$30	90	$270	$300
Z	9	$45	85	$255	$300
Z	12	$60	80	$240	$300
Z	15	$75	75	$225	$300
	18	$90	70	$210	$300
Y	21	$105	65	$195	$300
Y	24	$120	60	$180	$300
Y	27	$135	55	$165	$300
Y	30	$150	50	$150	$300
Y	33	$165	45	$135	$300
Y	36	$180	40	$120	$300
X	39	$195	35	$105	$300
X	42	$210	30	$90	$300
X	45	$225	25	$75	$300
X	48	$240	20	$60	$300
X	51	$255	15	$45	$300
X	54	$270	10	$30	$300
X	57	$285	5	$15	$300

Use the data given below-to eliminate possibilities from the chart.

1. There must be more students than adults. (Put an x in front of the rows for answers you must eliminate.)

2. The school must spend less than $100 on adult tickets. (Put a y in front of the rows for new answers you can eliminate.)

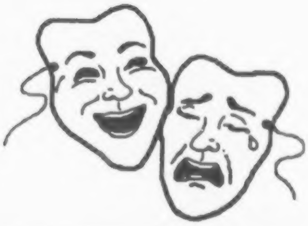
3. The bus holds only 89 passengers. (Put a z in front of the rows for new answers you can eliminate.)

4. How many adults and how many students are going on this trip?

   Adults 18 Students 70

5. Could you have arrived at his answer using only two clues above or were all three necessary? Only clues 2 and 3 are needed.

Name ____________________



GOING TO THE MOVIES
Student Activity Sheet 1

Number of Adult tickets	Total Cost of Adult tickets	Number of Student Tickets	Total Cost of Student Tickets	Total Cost of All tickets
→5X→		→3X→		
3	$15	95	$285	$300
				$300
				$300
				$300
				$300

Name ____________________

ADMIT
ONE

GOING TO THE MOVIES
Student Activity Sheet 2

Number of Adult tickets	Total Cost of Adult tickets	Number of Student Tickets	Total Cost of Student Tickets	Total Cost of All tickets
→5X→		→3X→		
3	$15	95	$285	$300
6	$30	90	$270	$300
9	$45	85	$255	$300
12	$60	80	$240	$300
15	$75	75	$225	$300
18	$90	70	$210	$300
21	$105	65	$195	$300
24	$120	60	$180	$300
27	$135	55	$165	$300
30	$150	50	$150	$300
33	$165	45	$135	$300
36	$180	40	$120	$300
39	$195	35	$105	$300
42	$210	30	$90	$300
45	$225	25	$75	$300
48	$240	20	$60	$300
51	$255	15	$45	$300
54	$270	10	$30	$300
57	$285	5	$15	$300

Use the data given below to eliminate possibilities from the chart.

1. There must be more students than adults. (Put an **x** in front of the rows for answers you must eliminate.)
2. The school must spend less than $100 on adult tickets. (Put a **y** in front of the rows for new answers you can eliminate.)
3. The bus holds only 89 passengers. (Put a **z** in front of the rows for new answers you can eliminate.)
4. How many adults and how many students are going on this trip?

   Adults ____________________ Students ____________________
5. Could you have arrived at this answer using only two clues above or were all three necessary? ____

   ____

GOING CAMPING

GRADE:	5 - 6
STRAND:	Number
SKILL:	Solve real life problems.

MANAGEMENT

CLASS ORGANIZATION:	Small groups
TIME FRAME:	Two math periods
MATERIALS:	Calculator, Data Organization Sheet, Guess and Check Sheet
VOCABULARY:	Profit
PREREQUISITE SKILL:	Interpret decimal remainders

LESSON

- **DIRECTED INSTRUCTION:**

Tell each group they will be given a situation to solve in which they will be responsible for:

Organizing their data
Deciding what information is important
Determining a solution
Sharing with the class

- **GUIDED AND INDEPENDENT PRACTICE:**

1st Day of lesson

- Hand out Student Activity Sheet 1 and Data Organization Sheet.
- Students read the problem and work together to complete the Data Organization Sheet and then Student Activity Sheet 1.
- Students compare how they arrived at their answers. Make sure discussion focuses on how to deal with remainders in real life situations.

2nd Day of Lesson

- Hand out Student Activity Sheet 2 and Guess and Check Sheet. Have student complete both. Discuss results. Answers will vary.

- **EVALUATION:**

Teacher observation and Student Activity Sheets.

GOING CAMPING

Student Activity Sheet 1
Teacher Answer Sheet

Situation:

The students in room 18 want to go on a class camping trip.
There are 32 students in the class. Food will cost $2.25 per meal for each person. Students will bring their own clothes and a sleeping bag. The camping equipment will be borrowed from the students' families. School vans will be used to get to the campsite. The van holds 12 people and gets 15 miles per gallon. The school district will provide vans for free that normally rent for $60.00 per day. The campsite is 76 miles from the school. Gasoline costs $.93 a gallon.

Campsites cost $12.00 per night and each campsite will hold 8 people. The principal says there should be 1 adult for every 6 students. The camping trip will last from 5:00 p.m. Friday night to 4:00 p.m. Sunday afternoon.

The students must raise the money for gas, food, and the campsites for everyone involved.

How much money must be raised for each student to go on the camping trip? What is the total cost? Use the Data Organization Sheet to complete information below.

Total cost for food.	$513 [(32 students + 6 adults) x (6 meals @ 2.25/meal = Total]
Total cost for vans.	$37.70 [38 people ÷ 12 people/van = 3.2 need 4 vans.] [(2x76 miles) ÷ 15 mpg x $.93/gallon x 4 vans = Total.]
Total cost for campsite.	$120 [38 people ÷ 8 people/campsite = 5 campsites] [$12/night x 2 nights x 5 campsites]
Total cost for the trip.	$670.70
Total amount for each student to raise	$20.96 [Total cost for trip ÷ 32 students]

GOING CAMPING
DATA ORGANIZATION SHEET
Teacher Answer Sheet

PEOPLE GOING:

Number of Students 32

Number of Adults 6

TOTAL PEOPLE 38

MEALS:

Number of meals per person 6

Number of people 38

Total meals served 228

Cost per meal $2.25

Total food cost $513.00

VAN COST:

Total miles (round trip) 152

Miles per gallon 15

Total gallons 10.133

Cost per gallon $.93

Number of vans 4 Individual van cost (gas) $9.42

Total van cost (gas) $37.70
(rounded to nearest dime)

CAMPSITES:

Number of people 38

Number of people allowed
Per campsite 8

Number of campsites needed 5

Number of nights 2

Cost of a campsite per night $12.00

Total campsite cost $120.00

Total cost of food, transportation, and campground $670.70

GOING CAMPING

Student Activity Sheet 2
Teacher Answer Sheet

Situation:

> The students decided to sell pencils and erasers with the school name on them to raise money for the camping trip.
>
> Pencils cost $.05 each and erasers cost $.07 each. They plan to sell pencils for $.15 each and erasers for $.20 each.
>
> How many pencils and erasers must be sold to raise the money necessary to go on the camping trip?

Total cost of trip from Activity Sheet 1 ____ $670.70

Cost of 1 pencil ____ $.05

Selling price of 1 pencil ____ $.15

Profit on the sale of 1 pencil ____ $.10

Cost of 1 eraser ____ $.07

Selling price of 1 eraser ____ $.20

Profit on the sale of 1 eraser ____ $.13

To help you compete this Student Activity Sheet you need to first complete the Guess and Check Sheet.

Approximate number of pencils to be sold to meet goal

Profit on the sale of pencils

Approximate number of erasers to be sold to meet goal

Profit on the sale of erasers

TOTAL PROFIT

Answer will vary according to discussion in the process of working through the Guess and Checks Sheet.

Names________________ ____________ ____________ ____________

GOING CAMPING

Student Activity Sheet 1

Planners: ____________ ____________ ____________ ____________

Situation:

The students in room 18 want to go on a class camping trip.

There are 32 students in the class. Food will cost $2.25 per meal for each person. Students will bring their own clothes and a sleeping bag. The camping equipment will be borrowed from the students' families. School vans will be used to get to the campsite. The van holds 12 people and gets 15 miles per gallon. The school district will provide vans for free that normally rent for $60.00 per day. The campsite is 76 miles from the school. Gasoline costs $.93 a gallon.

Campsites cost $12.00 per night and each campsite will hold 8 people. The principal says there should be 1 adult for every 6 students. The camping trip will last from 5:00 p.m. Friday night to 4:00 p.m. Sunday afternoon.

The students must raise the money for gas, food, and the campsites for everyone involved.

How much money must be raised for each student to go on the camping trip? What is the total cost? Use Data Organization Sheet to complete information below.

Total cost for food.________________________________

Total cost for vans.________________________________

Total cost for campsite.________________________________

Total cost for the trip.________________________________

Total amount for each student to raise.________________________________

GOING CAMPING
DATA ORGANIZATION SHEET

PEOPLE GOING: Number of Students ____________________

Number of Adults ____________________

TOTAL PEOPLE ____________

MEALS: Number of meals per person ____________________

Number of people ____________________

Total meals served ____________________

Cost per meal ____________________

Total food cost ____________________

VAN COST: Total miles (round trip) ____________________

Miles per gallon ____________________

Total gallons ____________________

Cost per gallon ____________________

Number of vans ________ Individual van cost (gas) ________

Total van cost (gas) ____________________

(rounded to nearest dime)

CAMPSITES: Number of people ____________________

Number of people allowed

Per campsite ____________________

Number of campsites needed ____________________

Number of nights ____________________

Cost of a campsite per night ____________________

Total campsite cost ____________________

Total cost of food, transportation, and campground ________

Names________________ ____________ ____________ ____________

GOING CAMPING

Student Activity Sheet 2

Situation:

The students decided to sell pencils and erasers with the school name on them to raise money for the camping trip.

Pencils cost $.05 each and erasers cost $.07 each. They plan to sell pencils for $.15 each and erasers for $.20 each.

How many pencils and erasers must be sold to raise the money necessary to go on the camping trip?

Total cost of trip from Student Activity Sheet 1 ____________________

Cost of 1 pencil ____________________

Selling price of 1 pencil ____________________

Profit on the sale of 1 pencil ____________________

Cost of 1 eraser ____________________

Selling price of 1 eraser ____________________

Profit on the sale of 1 eraser ____________________

To help you compete this Student Activity Sheet you need to first complete the Guess and Check Sheet.

Approximate number of pencils to be sold to meet goal ____________________

Profit on the sale of pencils ____________________

Approximate number of erasers to be sold to meet goal ____________________

Profit on the sale of erasers ____________________

Total profit ____________________

Names____________ ____________ ____________ ____________

GOING CAMPING
GUESS AND CHECK SHEET

Total cost of trip from Activity Sheet 1 $______________

Estimate the number of pencils and erasers you will need to sell in order to earn just enough money for the trip. Write the estimate in the chart and use your calculator to compute the profit. In order to arrive at the amount of profit, you may need to do several estimates. Use each result to get as close to your goal as you can to meet expenses.

Estimated pencils to be sold	Profit per pencil	Profit from pencil sales	Estimated # of erasers to be sold	Profit per eraser	Profit from eraser sales	Total Profit from pencils and erasers

PARDON MY DEAR AUNT SALLY

GRADE:	7 - 8
STRAND:	Algebra
SKILL:	Use order of operations to compute.

MANAGEMENT

CLASS ORGANIZATION:	Partner/Individual
TIME FRAME:	One or two math periods
MATERIALS:	Calculator
VOCABULARY:	Order of operations, experiments
PREREQUISITE SKILL:	Basic operations, exponents

LESSON

- **DIRECTED INSTRUCTION:**
  - Teacher asks: "John put on his shoes and his socks and his pants. If this were the order in which he dressed, would it make sense? If not, why? What would be better?"

    "Now, use your calculator to solve 6 + 15 x 5 = ☐"

  - Teacher asks: "What answer did you get? Did anyone get another answer? How did you get your answers?"

  - Place the two possible responses on the board:

6 + 15 x 5 = ☐	6 + 15 x 5 = ☐
21 x 5 = ☐	6 + 75 = ☐
105 = ☐	81= ☐

  - Explain that mathematicians have developed rules to avoid getting two answers for this kind of problem. (Note: the "Rules for Order of Operations" page may be used as a transparency for the overhead projector.)

- **GUIDED PRACTICE:**
  - Hand out Student Activity Sheet 1 and a Rules For The Order of Operations.

    Part 1 Directions: Underline the pair of numbers and the operation you will do first and then complete the problem.

1. $8 + \underline{9 \times 7} = 71$
2. $135 - \underline{7 \times 9} = 72$
3. $29 + \underline{58 \times 32} = 1885$
4. $\underline{3 \times 15} - 11 = 34$
5. $\underline{58 \div 2} + 63 = 92$
6. $\underline{516 \div 6} + 742 = 828$

Discuss and verify correct responses.

- **INDEPENDENT PRACTICE:**

  Students complete Activity Sheet 1, Part 2.

Part 2 Directions: Use the Order of Operations to solve:

1. (5 x 3) + (9 x 6) + 10 = 79
2. 5 x (3 x 9) x (6 + 10) = 2160
3. (5 x 3) + 9 x (6 + 10) = 159
4. 12 x 15 + 17 x 19 = 503
5. 12 x 15 - 17 x 6 = 78
6. 12 ÷ 3 + 72 ÷ 9 = 12
7. 115 ÷ 5 - (18 - 12) = 17
8. 42 + 37 + 15 - 2 x 3 = 88
9. 42 + 37 + (15 - 2) x 3 = 118
10. 42 + 30 ÷ 15 x 3 = 48

- **EVALUATION:**

  Teacher observation and Student Activity Sheets.

- **EXTENSION ACTIVITY**

  Students complete Student Activity Sheet 2.

PARDON MY DEAR AUNT SALLY

Transparency

RULES FOR THE ORDER OF OPERATIONS

1) **PARENTHESES** [Do all operations x, +, + -, **INSIDE** parentheses ( ) first.]

2) **MULTIPLY & DIVIDE** [Multiply and divide in order. If division appears to the left of multiplication, then divide before multiplying.]

3) **ADD & SUBTRACT** [Add and subtract in order, left to right]

The acceptable answer to

6 + 15 x 5 would be the same as

6 + (15 x 5)=

or **6 + 75 = 81**

Memory device for this rule:

Pardon	My	Dear	Aunt	Sally
a	u	i	d	u
r	l	v	d	b
e	t	i		t
n	i	d		r
t	p	e		a
h	l			c
e	y			t
s				
e				
s				

Name ______________

PARDON MY DEAR AUNT SALLY

RULES FOR THE ORDER OF OPERATIONS

1)	**PARENTHESES**	[Do all operations x, +, +, -, and powers **INSIDE** of parentheses ( ) first.]
2)	**MULTIPLY & DIVIDE**	[Multipy and divide in order. If division appears to the left of multiplication, then divide before multiplying.]
3)	**ADD & SUBTRACT**	[Add and subtract in order, left to right.]

The accepted answer to

6 + 15 x 5 would be the same as
6 + (15 x 5) =
6 + 75 = 81

Memory device for this rule:

Pardon	My	Dear	Aunt	Sally
a	u	i	d	u
r	l	v	d	b
e	t	i		t
n	i	d		r
t	p	e		a
h	l			c
e	y			t
s				
e				
s				

Name ____________________

PARDON MY DEAR AUNT SALLY

Student Activity Sheet 1

Part 1 Directions: Underline the pair of numbers and operation you will do first and then complete the problem.

1. 8 + 9 x 7 = ____________________
2. 15 - 7 x 9 = ____________________
3. 29 + 58 x 32 = ____________________
4. 3 x 15 - 11 = ____________________
5. 58 ÷ 2 + 63 = ____________________
6. 516 ÷ 6 + 742 = ____________________

Part 2 Directions: Use the Order of Operations to compute.

1. (5 x 3) + (9 x 6) + 10 = ____________________
2. 5 x (3 x 9) x (6 + 10) = ____________________
3. (5 x 3) + 9 x (6 + 10)= ____________________
4. 12 x 15 + 17 x 19 = ____________________
5. 12 x 15 - 17 x 6 = ____________________
6. 12 ÷ 3 + 72 ÷ 9 = ____________________
7. 115 ÷ 5 - (18 - 12) = ____________________
8. 42 + 37 + 15 - 2 x 3 = ____________________
9. 42 + 37 + (15 - 2) x 3 = ____________________
10. 42 + 30 ÷ 15 x 3 = ____________________

Name____________________

PARDON MY DEAR AUNT SALLY

Student Activity Sheet 2

RULES FOR ORDER OF OPERATIONS WITH EXPONENTS

1) PARENTHESES	[Do all operations x, +, +, -, and powers **INSIDE** of parentheses ( ) first.]
2) EXPONENTS	[Find value of any powers (exponents)]
3) MULTIPLY & DIVIDE	[Multipy and divide in order. If division appears to the left of multiplication, then divide before **multiplying.**]
4) ADD & SUBTRACT	[Add and subtract in order, left to right.]

Memory device for this rule:

( )	n^2	X	+	+	_
Please	Excuse	My	Dear	Aunt	Sally
a	x	u	i	d	u
r	p	l	v	d	b
e	o	t	i		t
n	n	i	d		r
t	e	p	e		a
h	n	l			c
e	t	y			t
s	s				
e					
s					

Rewrite the exponents: $2^3 = 2 \times 2 \times 2$

Example: $4 + 2^3$ is the same as $4 + 8 = 12$

$(2 + 4)^3$ is the same as $6^3 = 216$

1. $7 + 3^2 = 16$
2. $(7 + 3)^2 = 100$
3. $7^2 + 3 = 52$
4. $49^2 + 35 = 2436$
5. $(5 + 3) + 9 \times 6 + 10^2 = 162$
6. $(49 + 35)^2 = 7056$

Write and solve 5 new problems on the back of this page.

AN ANCIENT ODDITY

GRADE:	7 - 8
STRAND:	Patterns and Functions
SKILL:	Discover the pattern relationship between consecutive odd numbers and numbers to the third power. (Cube numbers)

MANAGEMENT

CLASS ORGANIZATION:	Individual or pairs
TIME FRAME:	One math period
MATERIALS:	Calculator, scissors
VOCABULARY:	Cubes and squares of numbers, exponential, archaeologist
PREREQUISITE SKILL:	Powers of numbers

LESSON

- **DIRECTED INSTRUCTION and GUIDED PRACTICE:**

Hand out Ancient Stone Tablet part 1 (Student Activity Sheet 1) and read the following motivating story to the class.

Archaeologists found an old stone tablet buried in the ruins of a destroyed city. Over the centuries some of the numbers on the tablet were damaged.

Your task is to figure out what the missing numbers are.

1. Tell the students to complete the blanks on the tablet by filling in the missing numbers to form a pattern. Assist students as needed by telling them the pattern is related to odd numbers.

- **INDEPENDENT PRACTICE:**

2. Teacher reads: **Years later the Archaeologists found the second part of the tablet.**
   Hand out Ancient Stone Tablet Part 2 (Student Activity Sheet 2).

3. Students use scissors to cut out the Ancient Stone Tablet. Place the second part of the tablet to the right of the first part.

4. Have students complete the numbers, and discuss the patterns that were originally written on the tablets.

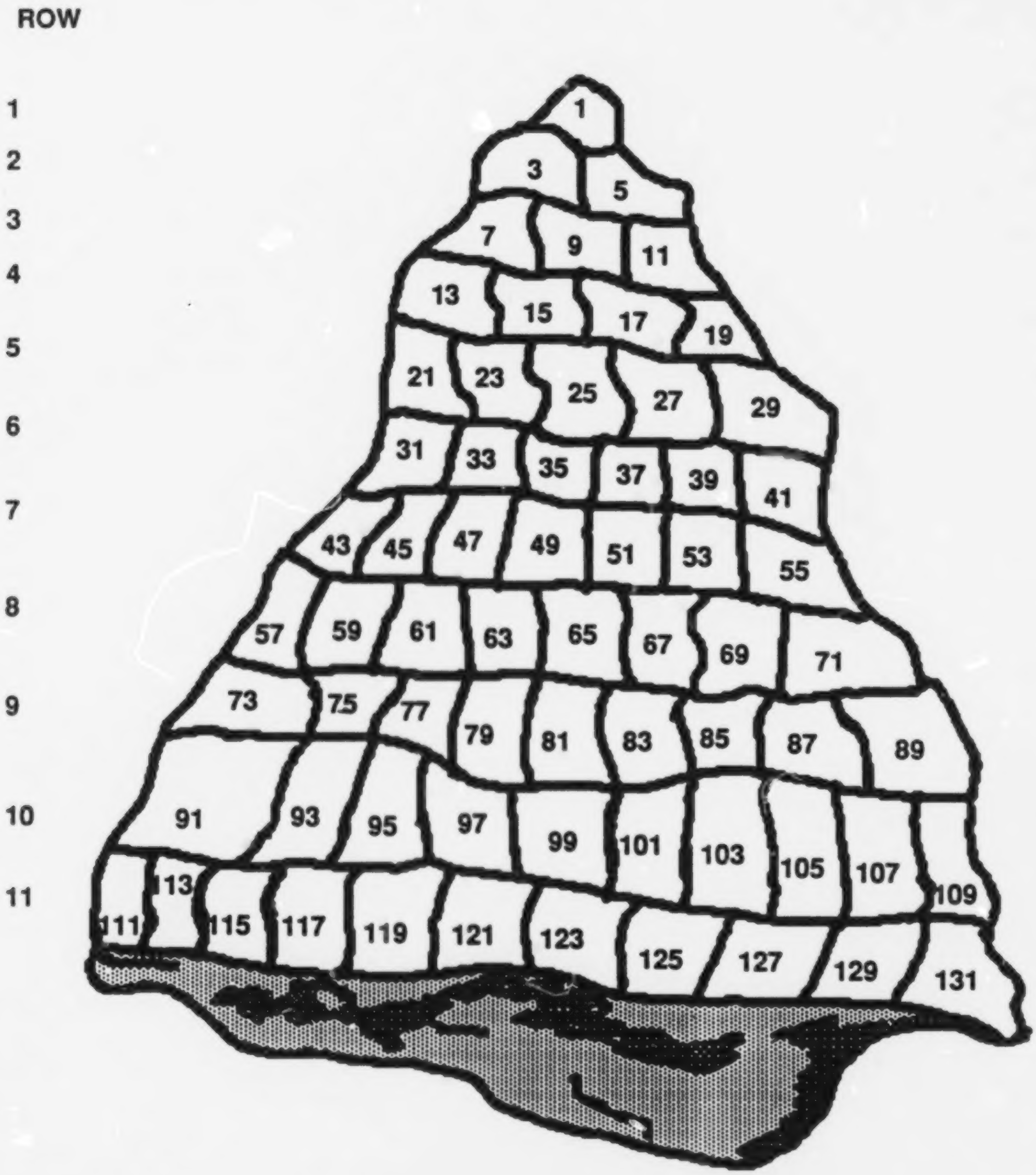
- **HOME ACTIVITY:**

Hand out Home Activity Sheet and have students complete the tablet and columns for homework.

AN ANCIENT ODDITY

Teacher Answer Key - Student Activity Sheet 1

1. Complete the blanks on the tablet by filling in the missing numbers to form a pattern.
2. What do you notice about the numbers on this tablet?


ROW
1
1
2
3 5
3
7 9 11
4
13 15 17 19
5
21 23 25 27 29
6
31 33 35 37 39 41
7
43 45 47 49 51 53 55
8
57 59 61 63 65 67 69 71
9
73 75 77 79 81 83 85 87 89
10
91 93 95 97 99 101 103 105 107 109
11
111 113 115 117 119 121 123 125 127 129 131

AN ANCIENT ODDITY

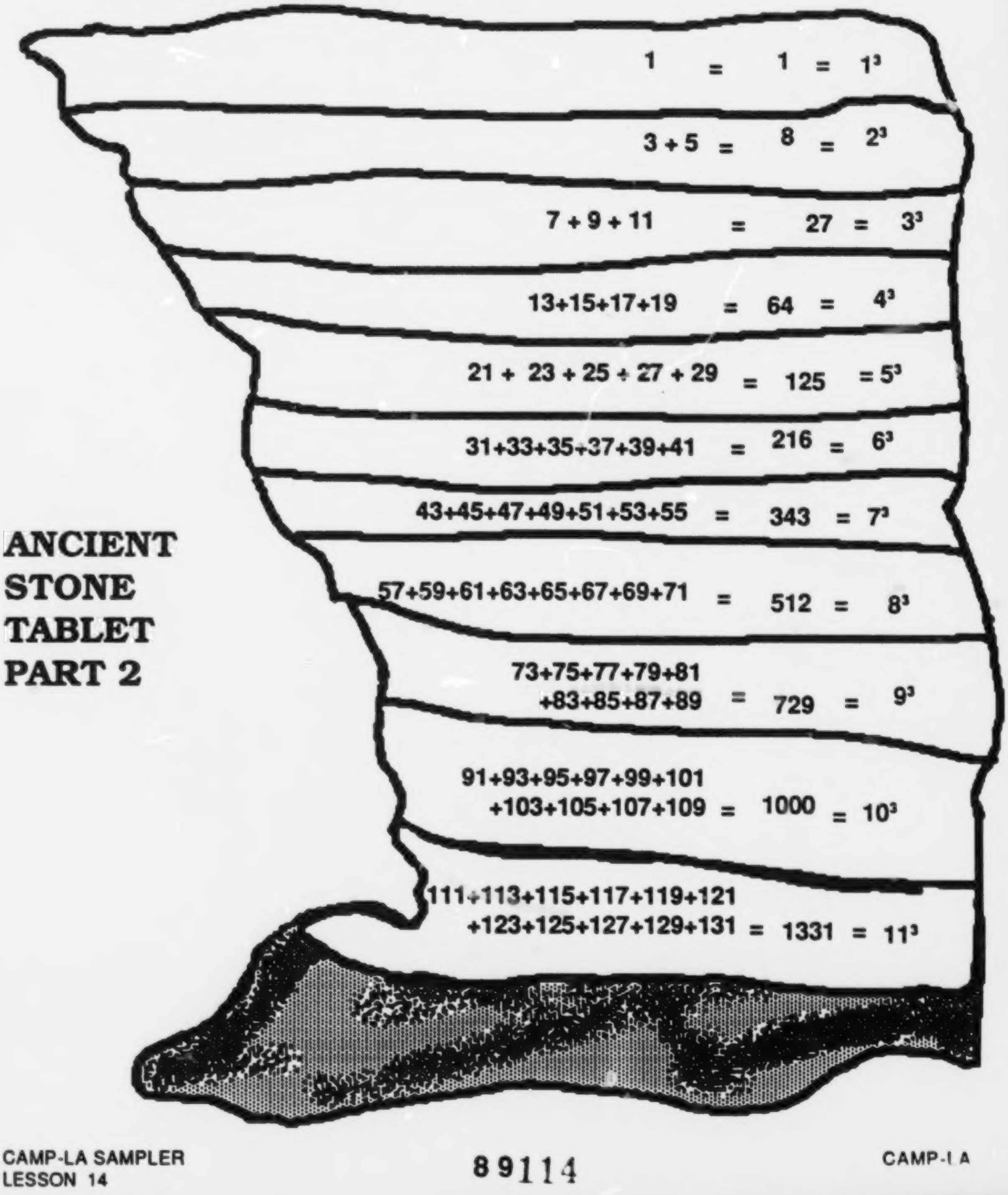
Teacher Answer Key - Student Activity Sheet 2

Years later Archaeologists found the second part of the tablet.

1. Cut out or place the two sections of the tablet together so the horizontal lines match.
2. Fill in the missing numbers to discover the pattern on the Ancient Tablet. What did you discover?

Teacher Note: The next to the last column consists of cube numbers. i.e. numbers found by multiplying a number by itself three times.
Example: 64 = 4 x 4 x 4

ANCIENT STONE TABLET PART 2



$1 = 1 = 1^3$

$3 + 5 = 8 = 2^3$

$7 + 9 + 11 = 27 = 3^3$

$13+15+17+19 = 64 = 4^3$

$21 + 23 + 25 + 27 + 29 = 125 = 5^3$

$31+33+35+37+39+41 = 216 = 6^3$

$43+45+47+49+51+53+55 = 343 = 7^3$

$57+59+61+63+65+67+69+71 = 512 = 8^3$

$73+75+77+79+81+83+85+87+89 = 729 = 9^3$

$91+93+95+97+99+101+103+105+107+109 = 1000 = 10^3$

$111+113+115+117+119+121+123+125+127+129+131 = 1331 = 11^3$

AN ANCIENT ODDITY

Teacher Answer Key - Home Activity Sheet

Row	ANCIENT STONE TABLET	A	B
1	1	1	1
2	1 3	4	2^2
3	1 3 5	9	3^2
4	1 3 5 7	16	4^2
5	1 3 5 7 9	25	5^2
6	1 3 5 7 9 11	36	6^2
7	1 3 5 7 9 11 13	49	7^2
8	1 3 5 7 9 11 13 15	64	8^2
9	1 3 5 7 9 11 13 15 17	81	9^2
10	1 3 5 7 9 11 13 15 17 19	100	10^2
11	1 3 5 7 9 11 13 15 17 19 21	121	11^2

The sum of the numbers in each row of tablet is to be written in column A. The row number raised to the second power is placed in column B.

Example: 1+3+5 =9 which is 3^2 or 3x3.

In row 25 you will have column A = 625 and column B = 25^2

© 1991 Cal St

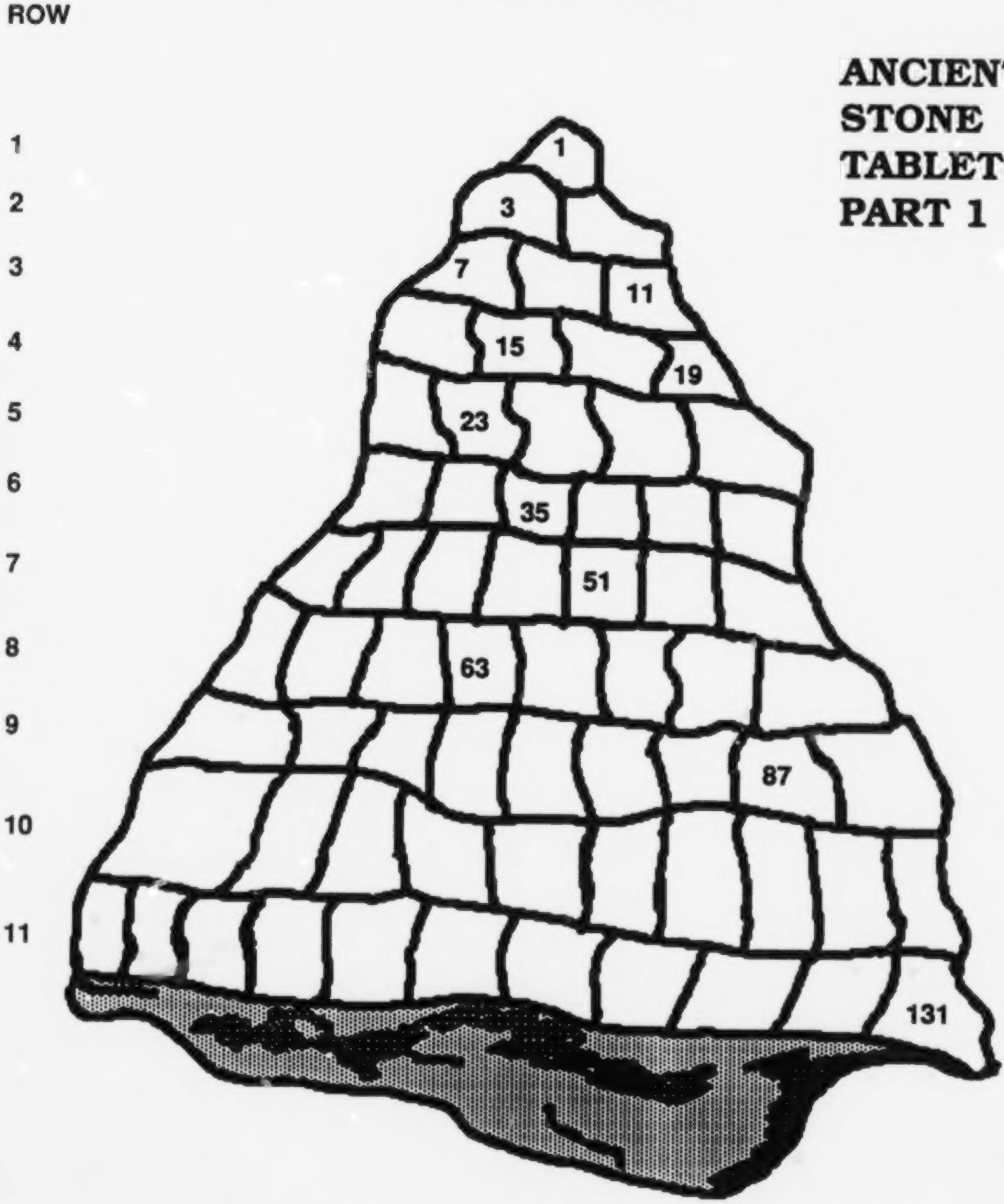
Name ______________________

AN ANCIENT ODDITY

Student Activity Sheet 1

1. Complete the blanks on the tablet by filling in the missing numbers to form a pattern.
2. What do you notice about the numbers on this tablet?

ANCIENT STONE TABLET PART 1


ROW
1
2
3
4
5
6
7
8
9
10
11
1
3
7
11
15
19
23
35
51
63
87
131

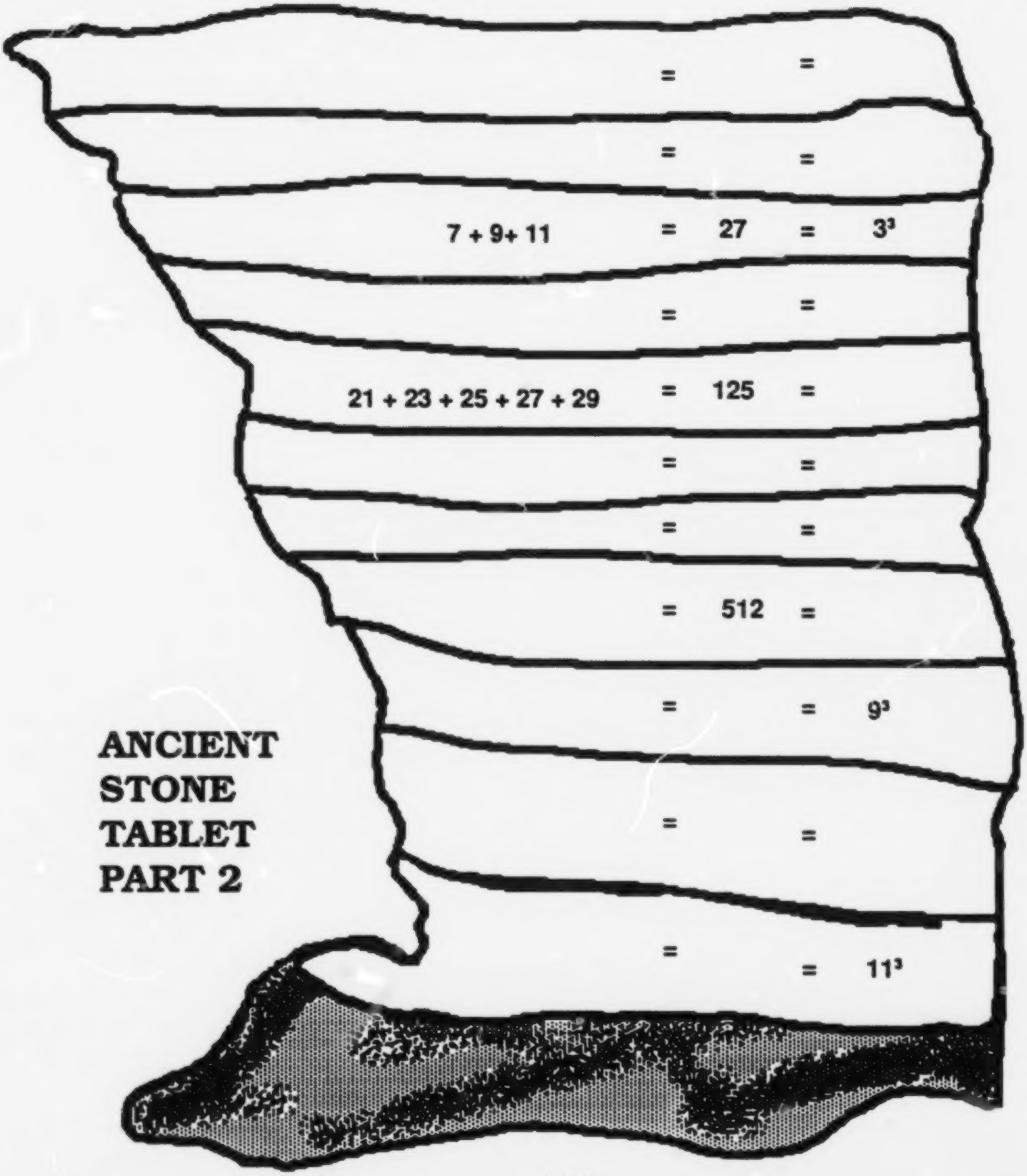
Name ________________________________

AN ANCIENT ODDITY

Student Activity Sheet 2

Years later Archaeologists found the second part of the tablet.

1. Cut out or place the two sections of the tablet together so the rows line up.
2. Fill in the missing numbers to discover the pattern on the Ancient Tablet. What did you discover?



	=		=	
	=		=	
7 + 9+ 11	=	27	=	3^3
	=		=	
21 + 23 + 25 + 27 + 29	=	125	=	
	=		=	
	=		=	
	=	512	=	
	=		=	9^3
	=		=	
	=		=	11^3

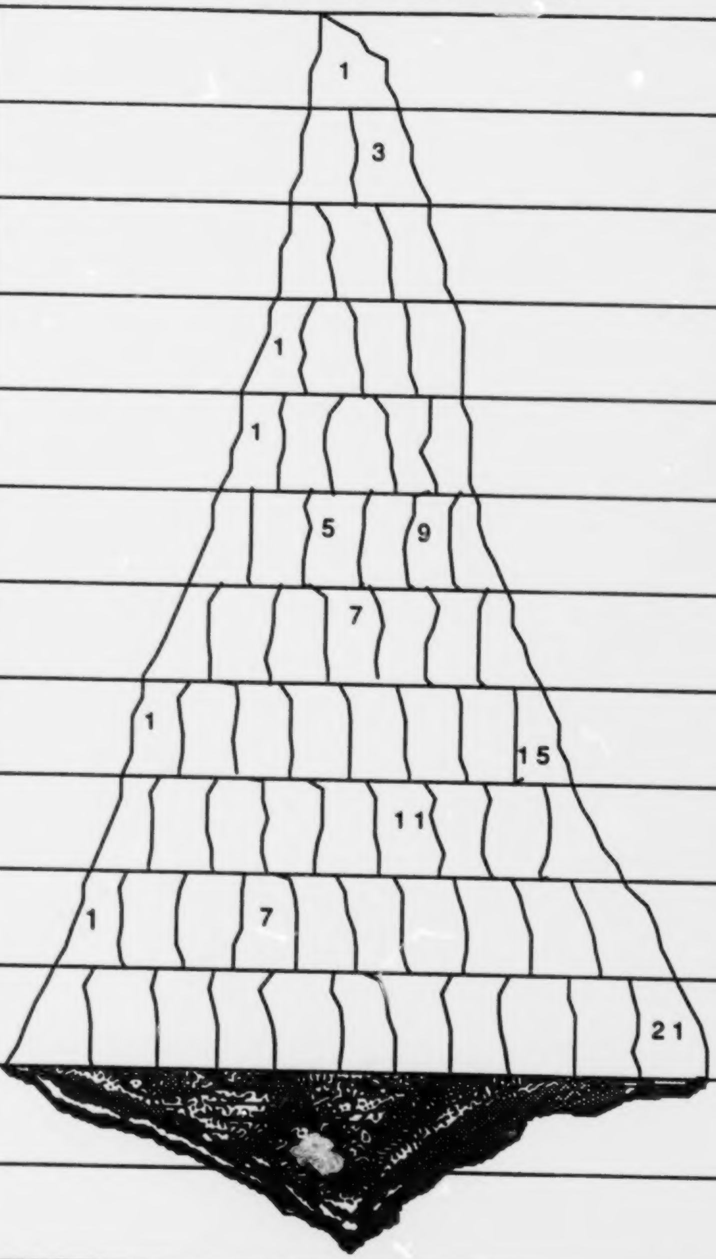
ANCIENT STONE TABLET PART 2

Name ____________________

AN ANCIENT ODDITY

Home Activity Sheet

1. Complete the blanks on the tablet by filling in the missing number to form a pattern.
2. Use the numbers of each row to complete column A and B.
   (Hint: What kind of numbers are found in the tablet.)



Row	ANCIENT STONE TABLET	A	B
1	1	1	
2	3		2^2
3			
4	1	16	
5	1		
6	5 9	36	
7	7		
8	1 15		
9	11		9^2
10	1 7		
11	21		

What are the numbers for columns A and B in row 25? ____________

How does this tablet differ from the other Stone Tablets? ____________

____

ANOTHER FENCE ON THE WALL

GRADE: 7 - 8

STRAND: Measurement/ Geometry

SKILL: Investigate area of rectangles under a special condition

MANAGEMENT

CLASS ORGANIZATION: Whole class, pairs, or small groups

TIME FRAME: One math period

MATERIALS: Calculator

VOCABULARY: Dimensions, area, rectangle

PREREQUISITE SKILL: Area of a rectangle formula, graphing data

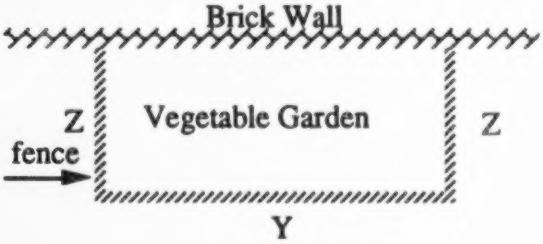
LESSON

- **DIRECTED INSTRUCTION:**

Explain that you want to fence a rectangular area in your back yard to be used for a vegetable garden. One side will be an existing brick wall. The other three sides are to be enclosed by 30 feet of fencing. You want to find which dimensions will create a rectangle, so that the area of the garden is as large as possible.

Hand out Student Activity Sheet 1 and a graph sheet. Ask them to fill in the first line of the chart. Z is 1 foot. Discuss.

If Z is 1 ft., there are 2 sides this size, then 2 x 1 or 2 feet of the original 30 feet of fence are used in those 2 sides. This leaves 30 - 2 or 28 feet for side Y.



Z	Y	Amount of fencing used 2 x Z + Y	Area of vegetable garden Z x Y sq.ft.
1	28	30	28

2 x Z + Y is 2 x 1 + 28 = 30 feet which shows that we didn't make a mistake in finding Y. Remember you should always end up using exactly 30 feet of fencing. Students record this answer on the graph.

- **GUIDED PRACTICE:**

Students fill in 2 on the chart for Z = 2 feet.
2 sides of 2 feet = 4 feet
1 side of 26 feet = 26 feet
Total = 30 feet

Students record this answer on the graph.

First use whole number choices for Z. When they have narrowed down their choices of whole numbers, they then start with decimals.

As an example of working with a decimal number, ask them to fill in a line on the chart for Z = 2.4 feet. They should realize 2 sides of 2.4 uses 2 x 2.4 or 4.8 feet of the fence, leaving 30 - 4.8 or 25.2 feet for the other side. So Y = 25.2 feet.

Checking for mistakes:
2 sides of 2.4 feet = 4.8 feet
1 side of 25.2 feet = 25.2 feet
Total fencing used = 30.0 feet

The area of the vegetable garden is 2.4 x 25.2 = 60.48 sq. ft.

Z	Y	Amount of fencing used 2 x Z + Y	Area of vegetable garden Z x Y sq.ft.
1	28	30	28
2.4	25.2	30	60.48

Ask what they observed. Guide them to notice that when Z increased by 1.4 ft., Y decreased by 2.8 ft., the area increased by 32.48 sq. ft., and the amount of fencing specified in the problem remains 30 feet. Students search for the largest possible area, using previous results as a guide.

Students record all trials on the graph.

- **INDEPENDENT PRACTICE:**

Students complete Student Activity Sheet 1, and graph each answer.

Upon completion of the Student Activity Sheet, discuss class observations from the chart and graph. They should find that the closer they chose Z to 7 or 8 inches the larger the area became, the further from 7 or 8 inches the smaller the area became. Those students who explore using decimals, between 7 and 8 find that the largest area occurs when Z = 7.5.

ANOTHER FENCE ON THE WALL

Teacher Answer Sheet

Below is an organized list of possible answers. Student choices for Z may vary from this.

Z	Y	Amount of fenced used 2 x Z + Y	Area of vegetable garden Z x Y sq.ft.
1	28	30	28
2	26	30	52
3	24	30	72
4	22	30	88
5	20	30	100
6	18	30	108
*7	16	30	112
*8	14	30	112
9	12	30	108
10	10	30	100
11	8	30	88
12	6	30	72
13	4	30	52
14	2	30	28

Z	Y	Amount of fenced used 2 x Z + Y	Area of vegetable garden Z x Y sq.ft.
7.0	16	30	112.00
7.1	15.8	30	112.18
7.2	15.6	30	112.32
7.3	15.4	30	112.42
7.4	15.2	30	112.48
*7.5	15.0	30	112.50
7.6	14.8	30	112.48
7.7	14.6	30	112.42
7.8	14.4	30	112.32
7.9	14.2	30	112.18
8.0	14.0	30	112.00

*You may wish to have them look at the results of the area columns of these two charts.

Another Fence On The Wall

Student Activity Sheet 1, page 2
Teacher Answer Key

Answers to student questions:

1. The dimensions for largest area are
   $Z = 7.5$ ft.
   $Y = 15$ ft.
   Area = 112.5 sq. ft.

   Since students are using guess and check they may not arrive at the exact answer.

2. A. Y is twice as big as Z. $(15 = 2 \times 7.5)$

   B. Y is $\frac{1}{2}$ of the amount of fencing used. $(15 = \frac{1}{2} \times 30)$ Z is $\frac{1}{4}$ of the amount of fencing used. $(7.5 = \frac{1}{4} \times 30)$

   C. You may wish to have students do the extension below or discuss the fact that 1, 2, and 3 above would be true for any size fence. If instead of 30 ft. you had 100 ft. of fencing, then
      a) Y would be $\frac{1}{2} \times 100$ or 50 ft.
      b) Z would be $\frac{1}{4} \times 100$ or 25 ft.
      c) Y would be as big as Z

- **EVALUATION:**
  Teacher observation and Student Activity Sheet.

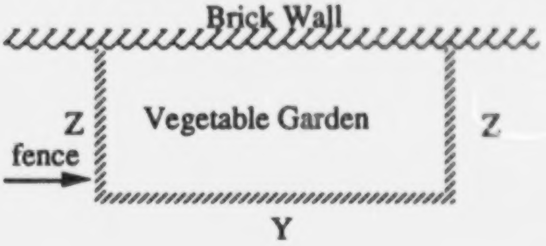
- **EXTENSION:**
  Student solve the same problem with 40 ft. or 100 ft of fencing.

Name____________________

ANOTHER FENCE ON THE WALL

Student Activity Sheet 1 page 1

You want to fence in a rectangular area in your backyard to be used for a vegetable garden. One side will be an existing brick wall. The other three sides are to be enclosed by exactly 30 ft. of fencing. You need to find which dimensions will create a rectangle, so that the area of the garden is as large as possible. Reminder: Area of a Rectangle = length x width.



Z (feet)	Y (feet)	Amount of fencing used 2 x Z + Y (feet)	Area of vegetable garden Z x Y (square feet)
1			

Name ____________________

Another Fence On The Wall
Student Activity Sheet 1, page 2

Additional workspace.

Z (feet)	Y (feet)	Amount of fencing used $2 \times Z + Y$ (feet)	Area of vegetable garden $Z \times Y$ (square feet)

Name ____________________

ANOTHER FENCE ON THE WALL

Student Activity Sheet 1, page 3

1. What dimensions gave the biggest area?

   Z = ______________ Y = ______________ Area = ____________

2. Use your Z and Y in question 1 to answer the following questions.

   A. What do you observe about the relationship of the width to the length in your solution? ____

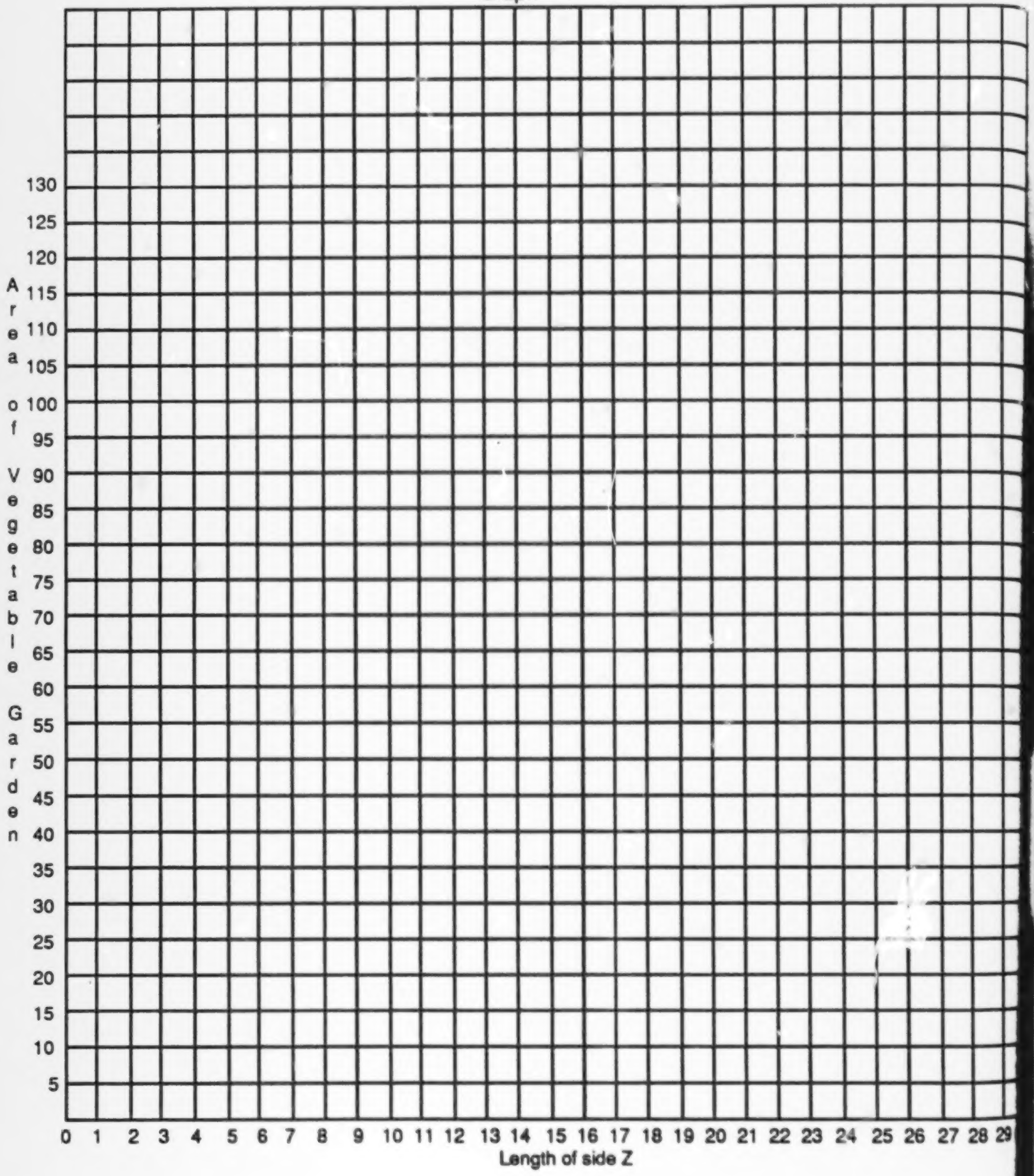
   B. What do you observe about the relationships between the width and the amount of fencing, and the length and the amount of fencing? __________

   C. Other observations. ____________________________________

Name ____________________

ANOTHER FENCE ON THE WALL

Graph



THIS LESSON RULES!

GRADE: 7 - 8

STRAND: Logic

SKILL: Classification, logical reasoning, rounding, using function rules.

MANAGEMENT

CLASS ORGANIZATION: Whole group, individual or pairs

TIME FRAME: One or two math periods

MATERIALS: Calculator, Data Recording Page

VOCABULARY: Odd, even

PREREQUISITE SKILL: Round numbers, order decimals, follow a defined rule, classification

LESSON

To the teacher: This lesson is different from any you may have seen before and certainly different from any your students have experienced. It is one of the CAMP-LA Lessons on original mathematical research at the student's level. As a teacher -- stress to the students that they are taking on the role of "research mathematicians."

- **DIRECTED INSTRUCTION:**

1. "Here is a rule that can be applied to numbers. We'll call it Function Rule F." On the board write

FUNCTION RULE F
Multiply the number by 7
and then round down* to
the nearest whole number

*(Rounding down is also called "truncating" or "chopping off" the fractional part.)

As a class, apply Rule F to several starting numbers to see what happens. For example, if you start with 5.4 you first multiply by 7, getting 37.8. Rounding down to the nearest whole number gives 37. So, Rule F, applied to 5.4, gives 37. We can write:

$$5.4 \xrightarrow{F} 37$$

You can read it as: "5.4 is changed by Rule F to 37" or "Rule F sends 5.4 to 37." Try several other examples by asking your students to supply the missing numbers. Use examples such as these:

	(answer)
$100 \xrightarrow{F} \underline{\ ?\ }$	(700, no rounding needed)
$100.1 \xrightarrow{F} \underline{\ ?\ }$	(700.7 → 700)
$100.2 \xrightarrow{F} \underline{\ ?\ }$	(701.4 → 701)

F

0.01 → _?_ (0.07 → 0)
F
0.86 → _?_ (6.02 → 6)

In discussing problems like the next three, be sure to get more than one starting number, but don't expect anyone to describe all possible starting numbers that work.

Begin with a number, apply Function Rule F, and get 35.

1

FUNCTION RULE F

_?_ → 35

Ask, "What could the starting number be?" Elicit student input. The function rule changes 5 into 35, and also any number from 5 up to but not including (5 $\frac{1}{7}$ or 5.142857 ...)

ANSWER KEY

FUNCTION RULE F

_?_ → 35

Any number between 5 and 5.142857 are possible numbers that work.

The range of products that will round down to 35 is 35 to 35.999999. The inverse of the function rule, (divide by 7) is applied above to find the range of missing factors.

2

FUNCTION RULE F

_?_ → 24

Ask, "What could the starting numbers be?" Solution: Divide 24 and 24.999999 by 7, that is, work backwards.

ANSWER KEY

FUNCTION RULE F

_?_ → 24

(3.4285714...
to
3.5714284...)

3

FUNCTION RULE F

$\underline{\ ?\ } \rightarrow 44.1$

Ask, "What could the starting numbers be?"
ANSWER KEY

FUNCTION RULE F

$\underline{\ ?\ } \rightarrow 44.1$

(no solution)

(Try any numbers as factors that students suggest, without comment, until they realize that no number will work since the result of applying Function Rule F must be a whole number.)

Function Rule F provides a way to separate all numbers into two groups - the ones that result in even numbers after applying Function Rule F and the numbers that result in odd numbers after applying Function Rule F:

RESULT IN EVEN NUMBER	RESULT IN ODD NUMBER

RESULT IN EVEN NUMBER	RESULT IN ODD NUMBER
100 (700)	5.4 (37)
100.1 (700)	100.2 (701)
3.49 (24)	5.0 (35)
0.01 (0)	5.1 (35)
0.86 (6)	$4\frac{1}{2}$ (31)
5.5 (38)	
3.52 (24)	
$3\frac{1}{2}$ (24)	

Draw a chart on the board as above. Put the starting numbers in the proper columns. Your chart might look like the one on the right. The results of applying Function Rule F are in parentheses.

Ask the students what they notice. A few observations might be:

- If a starting number is an even whole number, it will go in the EVEN column (because 7 times any even number is even).
- If a starting number is an odd whole number it will go in the ODD column (because 7 times any odd number is odd).
- If a number is a whole number plus $\frac{1}{2}$, then it will go in the column other than the one for the whole number by itself (e.g. $4\frac{1}{2}$ goes in the odd column because $4\frac{1}{2} \to 31$, whereas 4 goes in the even column; $3\frac{1}{2}$ goes in the even column because $3\frac{1}{2} \to 24$, whereas 3 goes in the odd column).

- Check any observations students notice to verify accuracy.

2. Now introduce Rule G

FUNCTION RULE G
Multiply the number by 8
and then round down to the
nearest whole number.

Notice that the only difference between Rules G and F is that G multiplies by 8 (rather than 7) before rounding down.
Apply Rule G to some of the numbers you have already used as starting numbers. For example:

5.4 $\xrightarrow{G}$ 43

100 $\xrightarrow{G}$? (800)

100.1 $\xrightarrow{G}$? (800)

100.2 $\xrightarrow{G}$? (801)

5 $\xrightarrow{G}$? (40)

? $\xrightarrow{G}$ 24

(Any number from 3 up to, but not including, $3\frac{1}{8}$ or 3.125. On the calculator, the largest number that works is 3.1249999).

? $\xrightarrow{G}$ 35

(Any number from $4\frac{3}{8}$ or 4.375 up to, but not including, $4\frac{1}{2}$ or 4.5).

3. Now draw a chart that allows us to classify a number according to both rules simultaneously. Label the four cells A, B, C and D for convenience.

RESULT OF USING RULE F

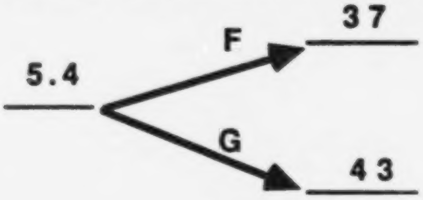
		EVEN	ODD
RESULT OF USING RULE G	EVEN	A.	B.
	ODD	C.	D.

Hand out Student Activity Sheet 1 and the Data Recording Sheet.

To place a number on this chart you must use both rules F and G on your starting number. For example, which cell does 5.4 go in? First apply F to 5.4. Write

$$5.4 \xrightarrow{F} 37$$

37 is odd, so the starting number 5.4 must go in the "ODD" column (cell B or D). What does Rule G do to 5.4? Continue your diagram like this:



43 is also odd, so 5.4 must go in the "ODD" row (cell C or D). Conclude that 5.4 must go in cell D, and write it in.

RESULT OF USING RULE F

		EVEN	ODD
RESULT OF USING RULE G	EVEN	A.	B.
	ODD	C.	D. 5.4

Students should record these results on their own chart and Data Recording Sheet. Similarly, they put other starting numbers that you have already used into their proper cells.

- **INDEPENDENT PRACTICE:**

Encourage students to use their Data Recording Sheets to find other numbers that would go in each of the cells.

When the students have had a chance to put several numbers in the chart, discuss class observations of results. As part of this discussion ask questions like:

- What are some numbers between 0 and 0.2 that would go in cell A? (Anything between 0 and 0.1249999.)

- What are some numbers between 0 and 0.2 that would go in cell C? (Anything between $\frac{1}{8}$ and $\frac{1}{7}$ i.e between 0.125 and 0.1428571.)

- What are some numbers between 0 and 0.2 that would go in cell B? (There aren't any.)

- Where do the whole numbers go? (Rule G, applied to any whole number, results in an even number, so all whole numbers must go in cells A or B. We already know that the even whole numbers must go in A or C, so in fact they must go in A. Similarly, the odd whole numbers must go in B.)

Extensions:

1. Suppose you used the following 100 starting numbers:

    0.00, 0.01, 0.02, 0.03, ..., 0.98, 0.99.

How do you think they would be distributed among the four cells? Would each cell get 25 of them? Look for efficient ways to decide where the 100 numbers go. (The chart below shows, surprisingly, that the 100 numbers are not distributed equally among the cells.)

RESULT OF USING RULE F

RESULT OF USING RULE G		EVEN	ODD
	Even	A. .00 .29 .58 .86 .01 .3 .59 .87 .02 .31 .6 .03 .32 .61 .04 .33 .62 .05 .34 .06 .35 .07 .36 .08 .37 .09 .1 .11 .12 (29 numbers)	B. .25 .5 .75 .26 .51 .76 .27 .52 .77 .28 .53 .78 .54 .79 .55 .8 .56 .81 .57 .82 .83 .84 .85 (23 numbers)
	Odd	C. .13 .38 .63 .88 .14 .39 .64 .89 .4 .65 .9 .41 .66 .91 .42 .67 .92 .68 .93 .69 .94 .7 .95 .71 .96 .97 .98 .99 (28 numbers)	D. .15 .43 .72 .16 .44 .73 .17 .45 .74 .18 .46 .19 .47 .2 .48 .21 .49 .22 .23 .24 (20 numbers)

Students who get this far should be encouraged to continue by looking at these 100 numbers: 1.00, 1.01, 1.02, ... 1.98,1.99. They will find that the full set of 200 numbers are more evenly distributed among the cells.)

2. Drop Rule G and replace it with Rule H. Hand out Student Activity Sheet 2.

RULE H
Multiply the number by 9
and then round down to
the nearest whole number.

Students explore how this rule change affects the classification of starting numbers. More generally, students can explore what happens when the rules are changed to multiply by other numbers before rounding down.

Name____________________

THIS LESSON RULES!

Student Activity Sheet 1

RULE F
Multiply the number by 7
and then round down to
the nearest whole number

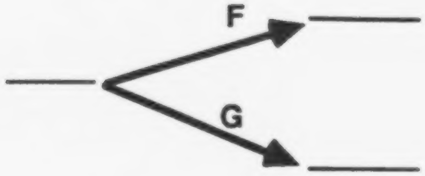
RULE G
Multiply the number by 8
and then round down to
the nearest whole number

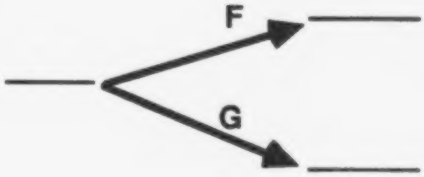
		RESULT OF USING RULE F	
		EVEN	ODD
RESULT OF USING RULE G	EVEN	A.	B.
	ODD	C.	D.

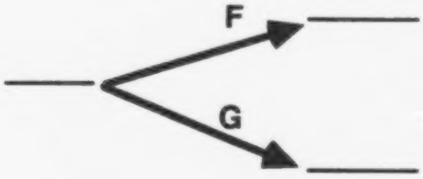
Name ____________________

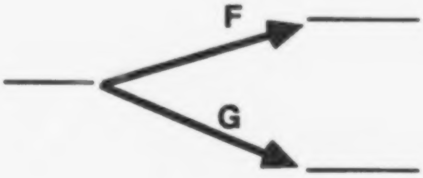
THIS LESSON RULES!

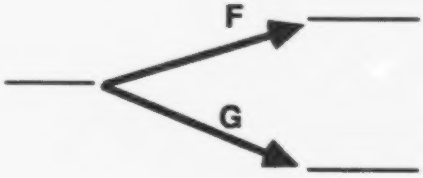
Data Recording Sheet

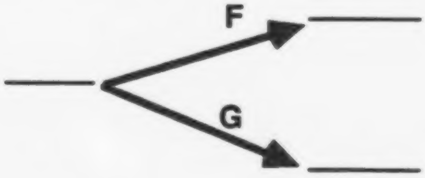


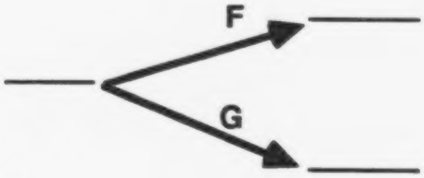


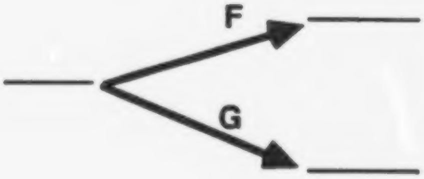


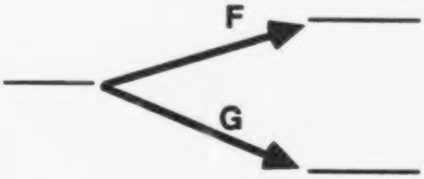


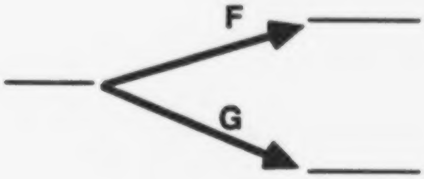


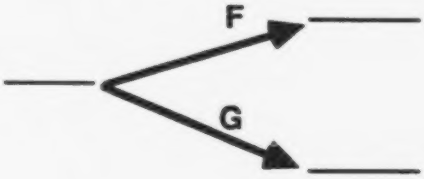


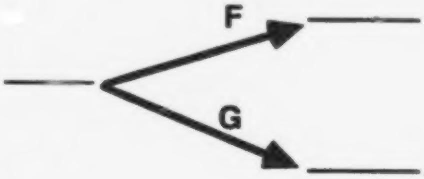












Name____________________

THIS LESSON RULES!
Student Activity Sheet 2

RULE F
Multiply the number by 7 and then round down to the nearest whole number

RULE H
Multiply the number by 9 and then round down to the nearest whole number

		RESULT OF USING RULE F	
		EVEN	ODD
RESULT OF USING RULE H	EVEN	A.	B.
	ODD	C.	D.

0123456789

SAMPLE ASSESSMENT:

Lessons 4 - 16

1. **Vehicles on Highway 3**

Vehicle	**Length**
18 Wheeler	**48 feet**
Pickup	**18 feet**
Delivery Van	**16 feet**
Car	**12 feet**

Vehicles traveling on Highway 3 have to take a ferryboat to cross the Deep River. The ferry is 20 yards long.

What combinations of vehicles can be on the ferry at any crossing if we want the ferry to be as full as possible?

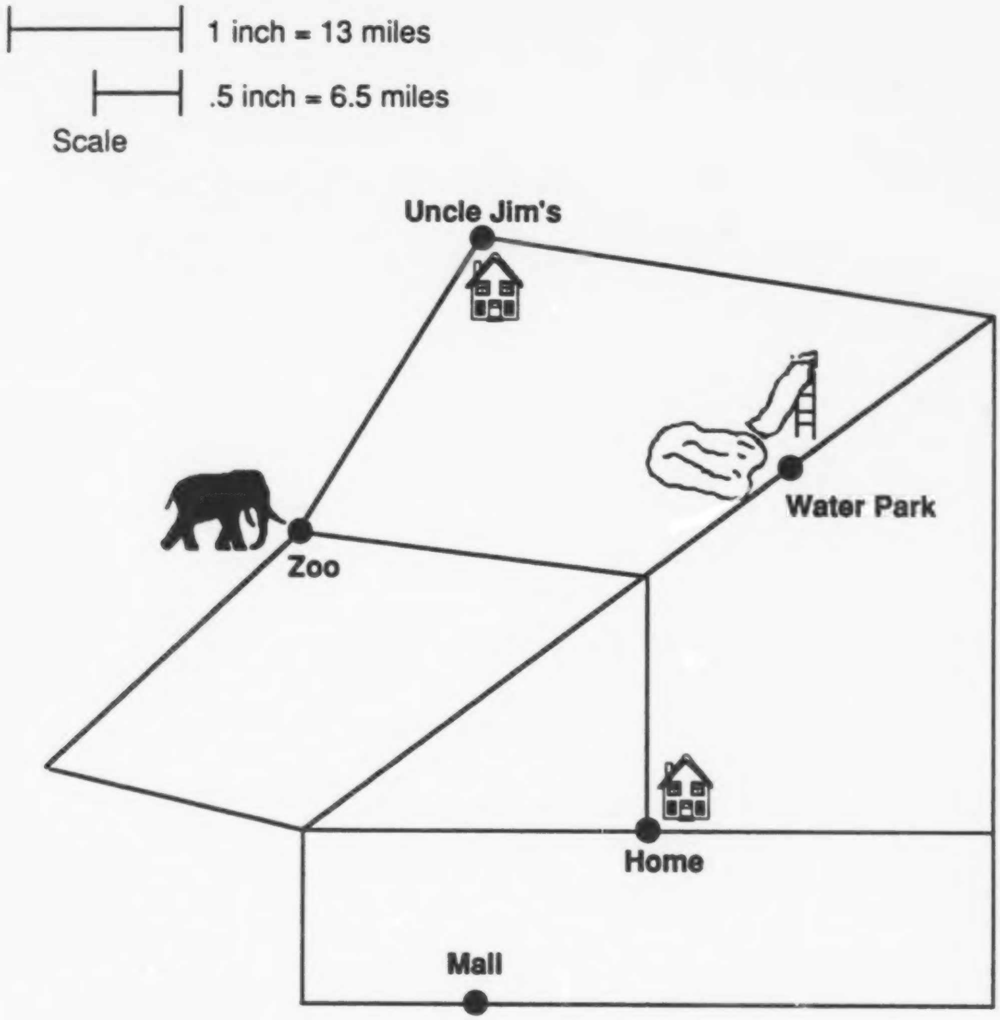
Student response should include:

Convert 20 yards to 60 feet.

Add to find vehicles whose combined lengths would be 60 feet or less.

1.	1-18 wheeler and 1 car	60
2.	1 pickup and 2 delivery vans	50
3.	1 pickup, 1 delivery van and 2 cars	58
4.	1 pickup and 3 cars	54
5.	2 pickups and 1 delivery van	52
6.	2 pickups and 2 cars	60
7.	3 pickups	54
8.	1 delivery van and 3 cars	52
9.	2 delivery vans and 2 cars	56
10.	3 delivery vans and 1 car	60
11.	5 cars	60

2. **Measure and record the lengths on the map in inches and and miles. Find the shortest route to each destination.**


1 inch = 13 miles
.5 inch = 6.5 miles
Scale
Uncle Jim's
Water Park
Zoo
Home
Mall

a. **From Home to Uncle Jim's** ________________________

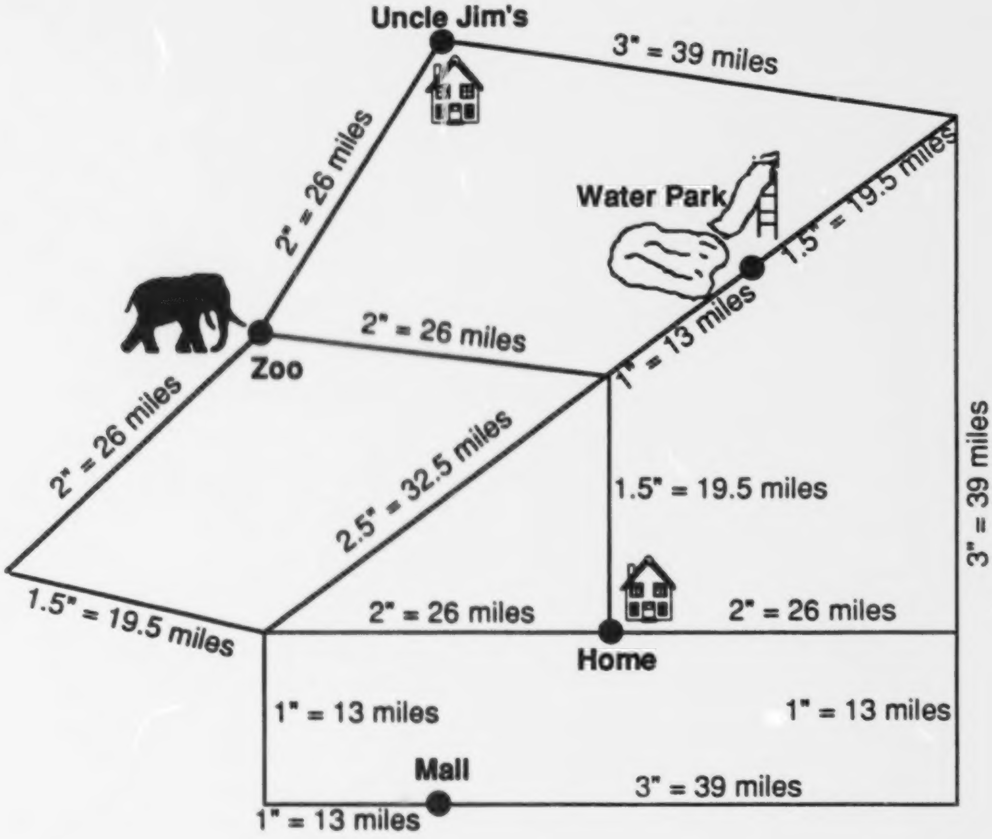
b. **From Home to the Mall** ____________________________

c. **From Home to the Water Park, to the 200, and back home** _______________

d. **The shortest route from Uncle Jim's to the Mall?** _________________

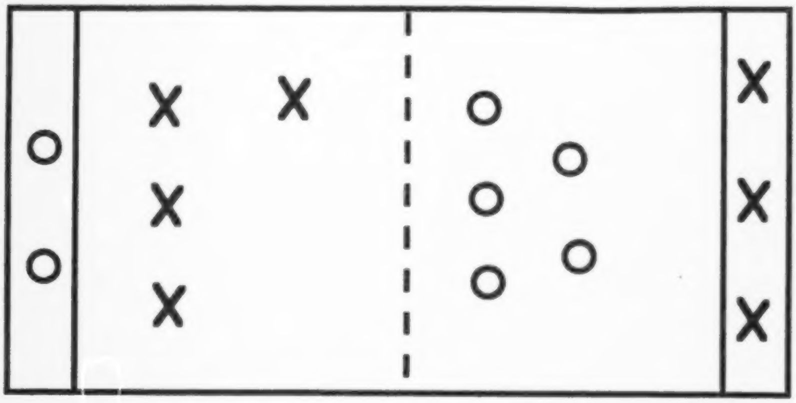
e. **The longest route from the Mall to Uncle Jim's? You may not use the same road twice.** ____

Student responses should include:


Uncle Jim's
3" = 39 miles
2" = 26 miles
Water Park
1.5" = 19.5 miles
2" = 26 miles
Zoo
1" = 13 miles
2" = 26 miles
2.5" = 32.5 miles
1.5" = 19.5 miles
3" = 39 miles
1.5" = 19.5 miles
2" = 26 miles
2" = 26 miles
Home
1" = 13 miles
1" = 13 miles
Mall
3" = 39 miles
1" = 13 miles

a. From Home to Uncle Jim's [5.5" = 71.5 miles]
b. From Home to the Mall [4" = 52 miles]
c. From Home to the Water Park, to the 200, and back home [9" = 117 miles]
d. The shortest route from Uncle Jim's to the Mall? [7.5" = 97.5 miles]
e. The longest route from the Mall to Uncle Jim's? You may not use the same road twice. [answers will vary]

3.



The double dodgeball court is 24 feet long and 16 feet wide. What is the perimeter of the court? ________
What is the area of the court? ________________________

How did you use your calculator to find the perimeter and the area?

____

____

Student responses should include:

a. The perimeter is 80 feet long.
b. The area is 384 square feet.
c. Students will add two lengths plus two widths for the perimeter and will not necessarily need the calculator. They multiply length x width for the area using the calculator.

4. Square each of the following numbers and look for a pattern.

21 ________ 22 ________ 23 ________ 24 ________ 25 ________

26 ________ 27 ________ 28 ________ 29 ________ 30 ________

Describe the pattern you find.

____

____

Does the pattern remain the same for 31 to 39? ________
Show your answer.

_____ _____ _____ _____ _____

_____ _____ _____ _____

Student response should include:

n^2 441 - 484 - 529 - 576 - 625 - 676 - 729 - 784 - 841 - 900
difference 43 45 47 49 51 53 55 57 59

a. Multiply each number by itself to find the square number.
b. Subtract smaller square number from the next larger square to find the difference between them.
c. Recognize pattern of odd numbers in the differences.

n^2 961 - 1024 - 1089 - 1156 - 1225 - 1296 - 1369 - 1444 - 1521
difference 63 65 67 69 71 73 75 77

a. The differences are the odd numbers from 63 to 77.
b. The pattern of odd numbers is the same.

5.

Attendance Statistics for Three Amusement Parks

	Magic Playground	**Sandyland**	**Enchanted Island**
January	**78,261**	**76,359**	**78,103**
February	**81,026**	**74,297**	**75,621**
March	**78,596**	**79,485**	**80,139**
Total			

a. Find the average attendance for the three months for each amusement park.
Magic Playground ________________
Sandyland ________________
Enchanted Island ________________

b. Use the average to determine in which month each park might expect its one millionth visitor.
Magic Playground ________________
Sandyland ________________
Enchanted Island ________________

c. How did you find your answers?

Student response should include:

Chart totals:

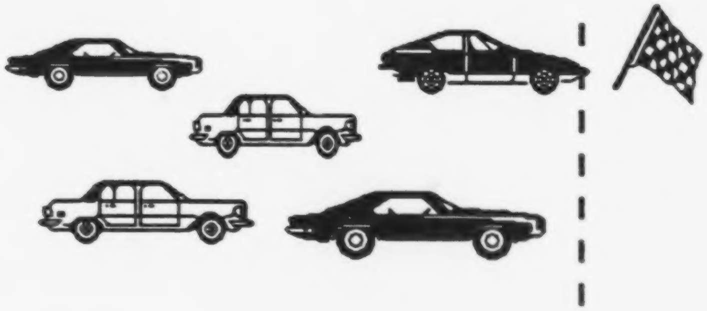
Magic Playground	Sandyland	Enchanted Island
237,883	230,141	233,863

a. 79294 (rounded to the nearest person)
76714 (rounded to the nearest person)
77954 (rounded to the nearest person)

b. January of following year
February of following year
January of following year

c. Add the total attendance and the average until the display shows 1,000,000 or more.
Use the constant feature for addition. Example: 237883 + 79294 = = = ...
Student might also multiply the average by 12 to estimate a full year's attendance, then add the average amount until 1,000,000 is exceeded.

6.



Places

		1	2	3	4	5
Car Numbers	256					
	512					
	394					
	141					
	253					

The first 5 cars to finish a race lost their car numbers. Use the logic grid and clues to find the numbers of the cars and in what place they finished.

a. **The car that finished third has a number that is a multiple of 16.**
b. **The second place finisher's number is half as large as the third place car.**
c. **The fourth place car's number is a palindrome.**
d. **The sum of the fourth and fifth place finishers' numbers equals the winner's number.**

Student responses should include:

		Places				
		1	2	3	4	5
Car Numbers	256		Yes			
	512			Yes		
	394	Yes				
	141				Yes	
	253					Yes

Lessons 9 - 12

7. a. **Which do you think is larger, 7^9 or 9^7? Estimate, then use the calculator.**

Student response: $7^9 = 40,353,607$ $9^7 = 4,782,696$ $7^9 > 9^7$

b. **Choose two different numbers for the base and power. Investigate using your calculator whether the smaller number as the base or the larger number as the base gives the greater answer. Record all results. Can you draw a conclusion?**

Student response should include examples showing that no conclusion can be reached. For example:

$1^2 = 1$ is less than $2^1 = 2$
$2^3 = 8$ is less than $3^2 = 9$
$3^4 = 81$ is greater than $4^3 = 64$
$4^5 = 1024$ is greater than $5^4 = 625$

8. **CAMP-LA Ice Cream store has 37 different flavors to offer. Discuss how many different ways you can make a two-scoop ice cream cone. Chocolate on top of vanilla is considered different than vanilla on top of chocolate.**

Student response: 1369. There are 37 choices for the first scoop and 37 choices for the second scoop. There are 37 x 37 = 1369 total possibilities.

9. **Steve is riding a bicycle with 24 inch diameter wheels on a 17 mile trip. Answer the questions below:**

Needed Information

12 inches = 1 foot
5280 feet = 1 mile

a. **How many feet long is the diameter of the wheel?**
b. **How many feet long is the circumference of the wheel?**
c. **How many feet long is the bicycle trip?**
d. **How many revolutions will the bicycle wheel make during the trip?**

Student responses:

a. 24 inches = 2 feet
b. c = 3.14 x 2 = 6.28 feet
c. 17 x 5280 = 89760 feet
d. $\text{Revolutions} = \frac{\text{distance}}{\text{circumference}} = \frac{89760}{6.28} = 14292.993 \approx 14293$ completed revolutions.

10. **How do you use a calculator to get a quotient with a whole number remainder? Write the steps used to find the quotient with a whole number remainder in simple language so that a young child would understand.**

Student response.

To use a calculator to find remainders in division of whole number problems:

1. Divide using the calculator.
2. Write down the whole number part of your answer. (Leave off the decimal part.)
3. Multiply the whole number part of your quotient by the divisor.
4. Subtract this result from the dividend.
5. The result should be your remainder.

$26\overline{)837}$

837 ÷ 26 shows 32.192307 on the calculator. Record the 32. Multiply 32 x 26 = 832. Subtract 832 from 837. 837 - 832 = 5. So $26\overline{)837}$ = 32 R5.

11. **Explain the numbers that appear in a calculator display when you do the following. Record after each press on the equal sign.**

   a. 75 + 58 = = = = =
   b. 1020 - 72 = = = = =
   c. 1024 ÷ 2 = = = = =
   d. 23 x 57 = = = =

   Student response:

   a. 75 + 58 = = = = = 133, 191, 249, 307, 365
   When "=" is first pressed the calculator computes 75 + 58. Each additional time "=" is pressed, the calculator adds 58 to the number in the display.

   b. 1020 - 72 = = = = = 948, 876, 804, 732, 660
   When "=" is first pressed the calculator computes 1020 - 72. Each additional time "=" is pressed, the calculator subtracts 72 to the number in the display.

   c. 1024 ÷ 2 = = = = =
   When "=" is first pressed the calculator computes 1024 ÷ 2. Each additional time "=" is pressed, the calculator divides the number in the display by 2.

   d. 23 x 57 = = = =
   When "=" is first pressed the calculator computes 23 x 57. Each additional time "=" is pressed, the calculator multiplies the number in the display by 23.

12. **Choose five different recording artists. Design a survey to determine the percent and number of students that prefer each artist. Display the results using charts and circle graphs. Interpret your findings, and compare them with other students' results.**

   Student response will vary.

13. **a. The rectangular floor of your kitchen has an area of 400 square feet. Write several possible dimensions for the room. Make a chart to display results.**

Length	**Width**	**Area**

b. How many possibilities are there?

Student responses may include:

Length	Width	Area
1	400	400
2	200	400
4	100	400
5	80	400
8	50	400
10	40	400
16	25	400
20	20	400

If only whole numbers are considered there are 8 possibilities. This assumes a 2 by 200 room is the same as a 200 by 2 room. If fractional dimentions are allowed. There is an infinite number of possibilities.

14. **Sparkling apple juice comes in three different sizes: 12, 32, and 48 fluid ounces. Today the market showed them priced as follows: 12 oz for $.55, 32 oz for $1.29, and 48 oz for $1.69. Which is the best size to buy? Explain.**

$.55 ÷ 12 oz ≈ .0458333
$1.29 ÷ 32 oz ≈ .0403125
$1.69 ÷ 48 oz ≈ .0352083

The 48 oz package is the least expensive per ounce. The best to buy may also take into account the size of the package and how often you drink apple juice.

CAMP - LA

PRESERVICE
SAMPLER BOOK
GRADES K - 8

Cal State Fullerton Press
2875 Orange/Olive Rd. Bldg #2
Orange, CA 92665
(714) 871-1984

ISBN: 1-870852-09-